Selenium Concentrations in the Tissues of Fish from the Upper McLeod and Upper Smoky River Systems

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Selenium Concentrations in the Tissues of Fish from the Upper McLeod and Upper Smoky River Systems

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EXECUTIVE SUMMARY

The present study compared selenium in fish tissues from flowing water systems near three west-central Alberta mountain coal mines in the upper McLeod and Smoky River systems to the toxicity effects thresholds developed by Lemly (1996). Overall, data for fish tissues collected in 2000 and 2001 by Alberta Sustainable Resource Development showed that selenium concentrations in rainbow and brook trout were usually greater than toxicity effects thresholds in the exposed streams compared to reference streams, particularly in the tissues of fish collected from waters draining the Luscar and Gregg River mines. General patterns for selenium concentrations in the remaining fish species sampled (bull trout, mountain whitefish, Arctic grayling, and longnose sucker) compared to effects thresholds were not always as apparent. This was to some extent due to the potential influences of spawning migrations of mountain whitefish and bull trout among the exposed and reference sampling locations, and the limitations of the dataset (i.e., small sample size and limited sample locations for some species).

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This project was a collaboration of Alberta Sustainable Resource Development (ASRD), Fisheries Management Branch, Edson and Alberta Environment (AENV), Water Sciences Branch, Edmonton. ASRD staff completed collections of fish tissues in 1999, 2000, and 2001; AENV provided technical support and contract management. Staff of AENV and ASRD assisted in completing this report. Special thanks to Paula Siwik, ASRD, for compiling the data and preparing graphics.

1.0 INTRODUCTION

Selenium is a naturally occurring element, commonly found in rocks and soil. Natural sources of selenium include Cretaceous marine sedimentary rocks, coal and other fossil fuel deposits.

Selenium is an essential nutrient, but may be toxic to organisms when present in the diet at concentrations slightly higher than levels required for nutrition. Elevated levels of selenium can lead to reduced growth, reproductive impairment, gill damage and increased mortality (e.g. Hodson et al. 1980, Hodson and Hilton 1983, Lemly 1993, Lemly 1997a).

Selenium uptake by fish occurs both directly from the water across the gills and across the gut from their diet. The form of selenium taken up across the gills is thought to be inorganic, either as selenite or selenate (Hodson and Hilton 1983). Uptake from the diet is most likely in an organic form (Hodson and Hilton 1983) where selenium has substituted for sulfur in the sulfur containing amino acids such as seleno-methionine.

Even though selenium may be present at relatively low concentrations in surface water and sediment it can bioaccumulate to high, potentially lethal, concentrations in aquatic organisms near the top of the food chain (Lemly 1997b). Laboratory studies have shown that the organic forms of selenium such as seleno-methionine have a higher bioaccumulation factor than the inorganic forms such as selenite and selenate (Besser et al. 1993).

Concerns regarding selenium in surface waters were expressed during the 1997 Cheviot Hearing based on the findings of elevated selenium in surface waters and fish close to coal mines in south eastern British Columbia. In late 1998, surface water samples collected from an end pit lake and streams at or close to the Luscar and Gregg River mines in west-central Alberta revealed selenium concentrations that exceeded the surface water quality guidelines for the protection of freshwater aquatic life (Alberta Environment 2000). As part of ongoing monitoring and research studies into the fate and effects of selenium, AENV initiated a study in the spring of 1999 to obtain data on the concentrations of selenium in surface water, sediment and aquatic biota (primarily rainbow trout, *Oncorhynchus mykiss*) at approximately 30 sites. The samples were mostly in flowing-waters at background or reference sites (not affected by mining or other major land disturbances) and at 'exposed' sites downstream of four coal mines in the upper portions of the McLeod, Smoky, and Pembina river basins. Samples were collected over three years from 1999 to 2001. Results of samples collected in 1998 and 1999 are presented in an interim AENV report (Casey and Siwik 2000) (see Appendix 1 for fish tissue data from 1999).

The main objective of this report is to:

- Assess and document data on selenium concentrations observed in fish tissue samples from a variety of fish species collected in 2000 and 2001.

It was recognized that prolonged sampling of certain populations of rainbow trout in these basins could have a detrimental effect on the sustainability of those local populations. In addition, selenium concentrations in other fish species may not be comparable to rainbow trout as a result of species-specific differences in selenium uptake or metabolism. Therefore, a secondary

objective of this study was to begin to evaluate the suitability of other fish species as key receptors with respect to selenium monitoring.

2.0 METHODS

2.1 Field Collection

2.1.1 Present Study

The study areas for fish tissue sampling in the upper McLeod and Smoky River systems are shown in Figures 1a and b. Present study sample sites, site descriptions, and selenium status of sites are presented in Table 1. The fish species sampled were: rainbow trout; brook trout, *Salvelinus fontinalis*; mountain whitefish, *Prosopium williamsoni*; longnose suckers, *Catostomus catostomus*; Arctic grayling, *Thymallus arcticus*; and bull trout, *Salvelinus confluentus*. Bull trout were collected only from the upper Smoky River basin as they are a species of special concern and are managed under special regulations including a zero-fish limit. Arctic grayling were found only in the Smoky River while longnose sucker were only collected from the Smoky and Middle McLeod River sites. Only one lake, Fairfax Lake, was sampled, as fish were not caught in the Cadomin Pit. In 2000, all fish were sampled in the fall or winter with the exception of Luscar and Deerlick rainbow trout (see Appendix 2 for fish tissue data from 2000). Luscar Creek and Deerlick Creek rainbow trout were sampled in the spring (June 2000) as part of a Department of Fisheries and Oceans (DFO) bioassay (Holm 2002, Holm et al. in prep.). Approximately 12 individuals of each target species were collected and kept on ice until they could be processed at the Fish and Wildlife laboratory. Fish were processed immediately upon return from field sites. In some cases, more than 12 fish were processed due to incidental mortalities.

In 2001, sites were sampled in July, August and September (see Appendix 3 for fish tissue data from 2001). All sites were sampled using a backpack electroshocker. As salmonids feed primarily at dawn or dusk, sampling was started at dusk in July and August, and dawn in September to ensure capture of fish with full stomachs. Species targeted were rainbow trout, brook trout, mountain whitefish, and bull trout. Up to 10 individuals of each species were sampled. High water in August 2001 precluded sampling the Gregg and McLeod rivers. The smaller creeks were sampled (Cold, Luscar and Deerlick) for stomach contents, however no tissue samples were collected. Fish were collected at all sites in September and muscle biopsy samples were taken before the fish were released.

Fish were processed in the field. Before processing, fish were anesthetized in a clove oil solution (1 mL clove oil + 10 mL ethanol in 10 L water; Prince and Powell 2000). Fish were then weighed, measured (fork length) and had their stomach contents pumped with a syringe apparatus similar to that outlined in Meehan and Miller (1978). Changes to their protocol included the use of flexible tubing on the syringe as outlined in Culp et al. (1988). Stomach contents of each fish were preserved in ethanol for future analysis (Stantec Consulting Ltd. 2004). Muscle biopsy samples were collected from the dorsal muscle in the vicinity of the dorsal fin in 2001 using a Miltex 1.5 mm dermal punch. Two plugs were needed to ensure sufficient tissue for analysis. The plugs were stored in small vials and the vials were placed into labeled Whirlpak® bags. Incidental mortalities were kept to obtain tissue for duplicate samples.

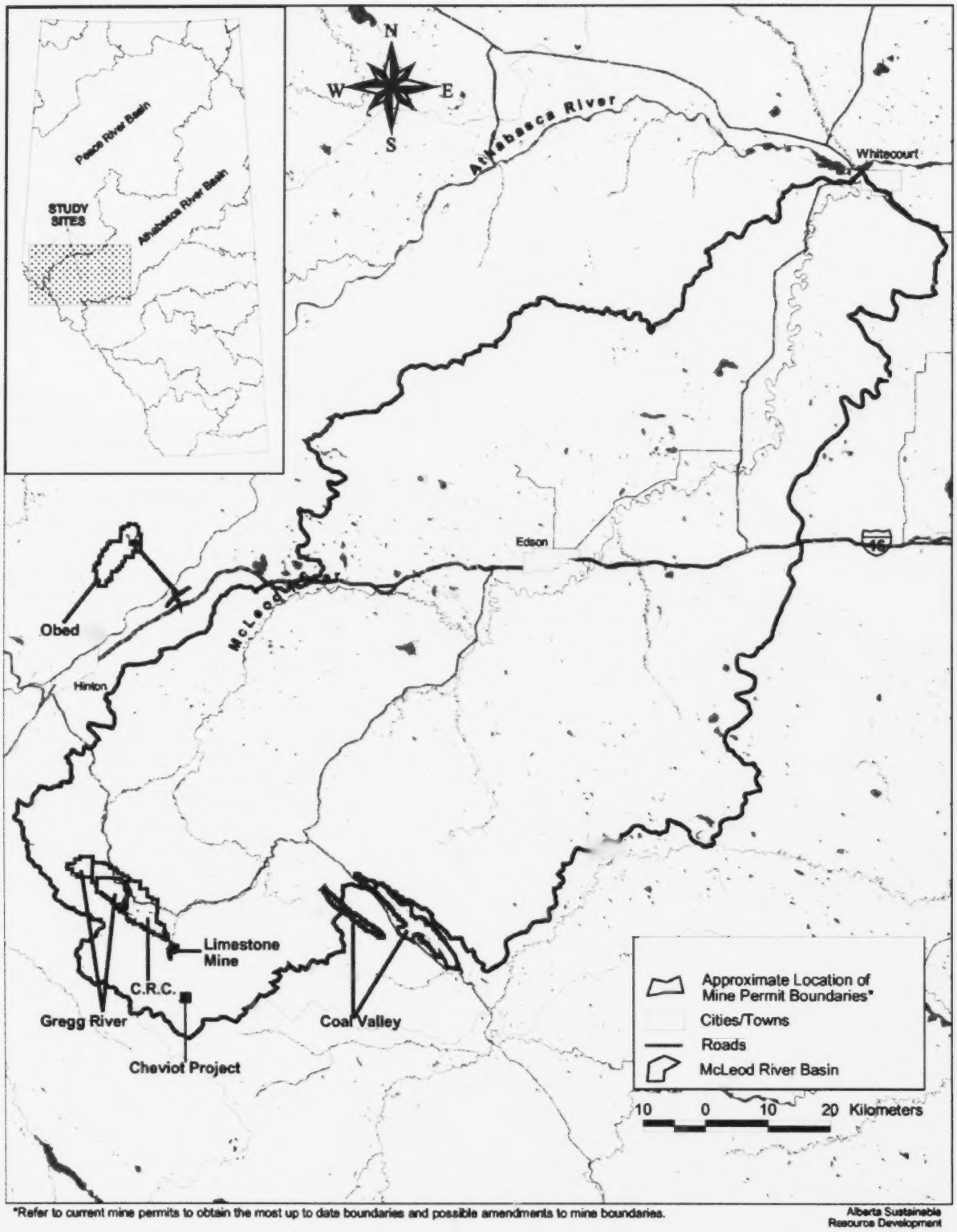

Figure 1a Study area for fish tissue sampling in the McLeod River basin, 2000-2001

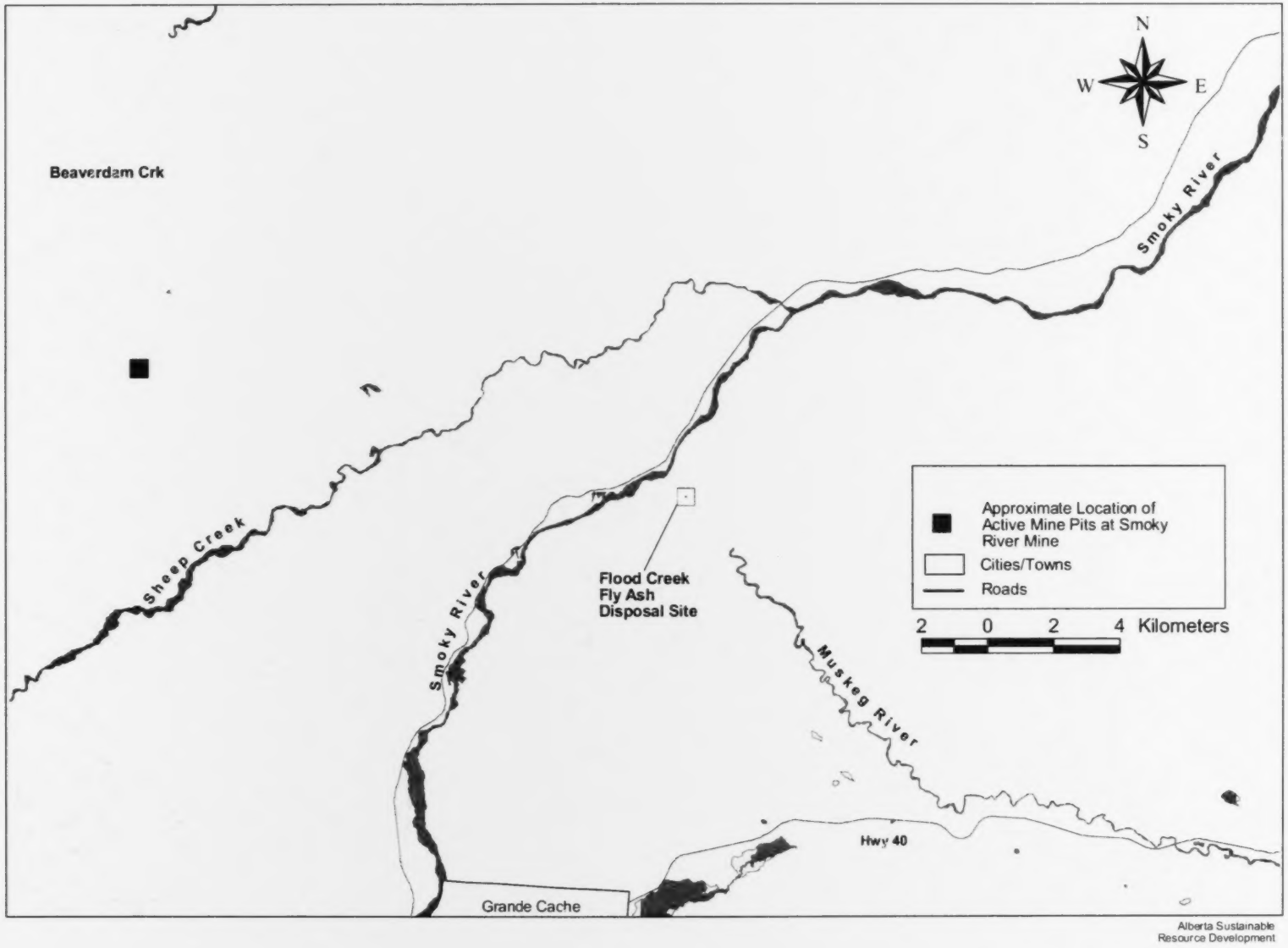

Figure 1b Study area for fish tissue sampling in the Smoky River basin, 2000-2001

Table 1 Present study sample sites in the upper Smoky and McLeod River systems

Sample Site	Site Description	Type of Site
Upper Smoky River System		
Smoky River	In the vicinity of the processing plant; sampled upstream and downstream of the confluence with Sheep Creek	Variable Exposure
Sheep Creek	Drains the east side of the Grande Cache coal mine; sampled downstream of a barrier falls that prevents upstream migration of fish	Exposed
Beaverdam Creek	Sampled downstream of settling pond; drains a portion of the Grande Cache mine site	Exposed
Muskeg River	Sampled downstream of Hwy 40 bridge; upstream of Flood Creek ash disposal site	Reference
Upper McLeod River System		
Cheviot Creek	Sampled downstream of Cheviot Lake (old mine pit)	Exposed
Whitehorse Creek	Sampled downstream of a barrier falls	Reference
Luscar Creek	Drains Luscar Mine area; downstream of Lac des Roches	Exposed
Upper McLeod River	Sampled downstream of Luscar Creek	Exposed
MacKenzie Creek	Sampled upstream of confluence with Little MacKenzie Creek	Reference
Deerlick Creek	Sampled at Tri-Creeks road crossing	Reference
Wampus Creek	Sampled upstream of lower road crossing	Reference
Gregg River	Drains Gregg River Mine area; upstream of Hwy 40 bridge	Exposed
Middle McLeod River	Sampled downstream of Gregg River	Exposed
Maskuta Creek (Tributary of Athabasca River)		
Cold Creek	Sampled downstream of Hwy 40 bridge and upstream of confluence with Still Creek	Reference
Lakes (McLeod River Basin except Fairfax Lake)		
Fairfax Lake	Pembina River Basin	Reference
Lac des Roches	Collects runoff from Luscar Mine	Exposed

Whole fish and fish tissue samples were kept on ice in the field then frozen at the Fish and Wildlife laboratory. Muscle plugs collected were shipped overnight on dry ice to the Alberta Research Council in Vegreville (ARCV) and analysed for arsenic (As), calcium (Ca), cadmium (Cd), lead (Pb), selenium (Se), zinc (Zn) and mercury (Hg). Samples of muscle from the incidental mortalities (11 fish) were also sent to ARCV for analysis.

Incidental mortalities were weighed and measured, and a sample of dorsal muscle tissue, liver and ovary (when available) were collected using a carbon steel knife and forceps. Tissue samples were stored individually in Whirlpak® bags and kept frozen until analysis. Specimens were randomly selected for duplicate muscle and ovary samples. Fish stomachs and aging structures were also removed for future analyses.

2.2 Analysis of Samples

2.2.1 Muscle Biopsy Data

Sampling in 2001 focused on the collection of muscle, mostly in the form of non-lethal sampling. Muscle samples were sent to ARCV for analysis and arsenic (As), calcium (Ca), cadmium (Cd), lead (Pb), selenium (Se), zinc (Zn) and mercury (Hg) were measured in the samples using inductively coupled plasma mass spectrometry (ICP-MS); however graphical presentation and interpretation is for selenium data only (Appendices 1, 2, and 3). Data for all elements analyzed for are provided in the electronic database (available upon request). Analytical detection limits for muscle biopsy data tended to vary as a result of the amount of tissue submitted. For example, dorsal plugs from larger fish yielded more muscle tissue thereby improving their detection limits.

Liver and ovary data for some Luscar Creek brook trout and rainbow trout, Cold Creek brook trout, and Deerlick Creek rainbow trout are not provided in this report, as they are part of the DFO bioassay study (Holm 2002, Holm et al. 2005). However, some ovary data is included on graphs for comparative purposes.

2.2.2 Data Analysis

Data that were below detection limits were estimated by dividing the detection limit in half (Newman 1995). It should be noted that all but two rainbow trout tissue samples from Deerlick Creek (reference) and two brook trout tissue samples from Cold Creek (reference) had selenium concentrations below detection limit, therefore for data analysis purposes the majority of data for the reference sites were estimated.

All data were analysed using the statistical software package SPSS 9.0. Data for each fish species from each site were compared to a normal distribution using a Kolmogrov-Smirnov test and homogeneity of variance was tested with Levene's test. While all data proved to be normal, in many instances it did not meet the assumption of homogeneity of variance. Data that met the assumptions of an ANOVA were analysed with a one-way ANOVA and Tukey's post-hoc test. In instances where data did not meet the assumptions of an ANOVA, a Kruskal-Wallis (non-parametric) test was used and post-hoc's calculated as outlined in Zar (1984). Ripe and unripe gonads were analysed separately.

Concentrations of selenium in all fish species from each site were also compared with one-way ANOVA or Kruskal-Wallis to determine if accumulation patterns among species were similar at different sites (secondary objective of this study).

Muscle selenium concentrations for each species were correlated with ovary and liver selenium concentrations to determine if there were any significant relationships. The combined ovary and liver datasets had a normal distribution, however, the muscle dataset was not normally distributed and was transformed using a $\log_{10}$ transformation.

3.0 RESULTS

Data were collected in 1999, 2000 and 2001; however, the most complete data set was collected in 2000. For this reason, data from 2000 were used to compare selenium concentrations in fish collected at reference sites with those in fish collected from exposed stream sites (i.e., downstream of mine activities).

The largest data set was obtained for mountain whitefish, a species that is known to move extensively during the year (Nelson and Paetz 1992). Muscle concentrations of selenium were near or below the thresholds set by Lemly (1996) for all mountain whitefish sampled (Figure 2). However, liver and ovary Se concentrations were above Lemly's thresholds in all whitefish collected, including reference fish from MacKenzie Creek (Figure 2). Fish collected in MacKenzie Creek had likely migrated upstream from areas with higher waterborne Se concentrations to spawn and, hence, are representative of differing exposure levels rather than reference conditions.

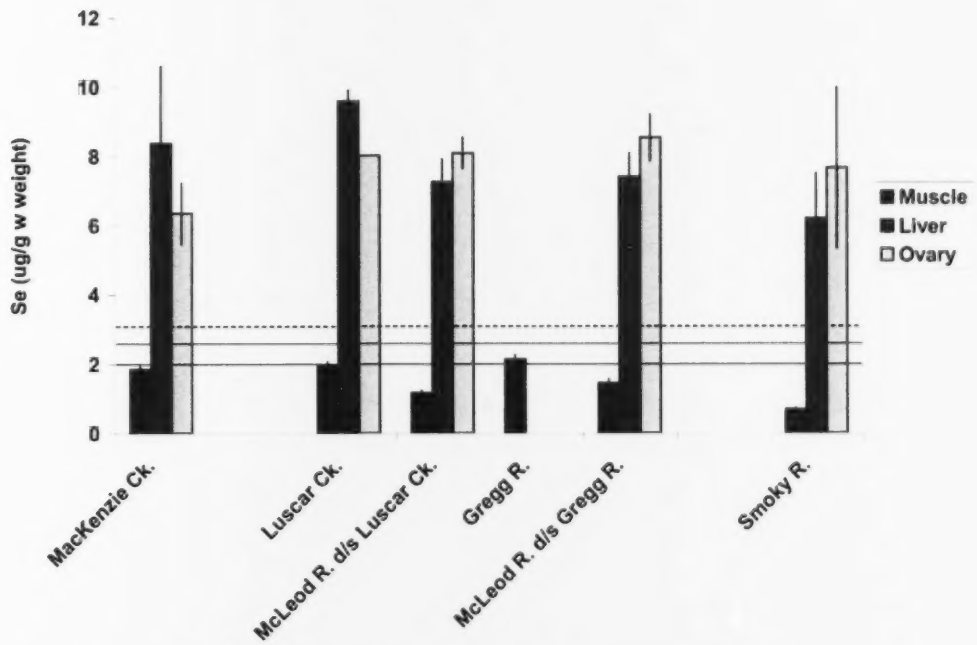

Figure 2 Selenium concentrations in tissues of mountain whitefish

Data were collected in late September and October, 2000. n values range from 12 to 14 for muscle and liver and from 1 (Luscar Creek) to 9 for ovaries. Vertical bars represent ± 1 SEM. Horizontal lines represent tissue thresholds for selenium as defined by Lemly (1996) converted to wet weight assuming a water content of 75%. Dark line is for muscle, light line for ovary/eggs and the dashed line is for liver.

Tissue levels of selenium in bull trout from the four areas sampled were near or below Lemly's thresholds for selenium (Figure 3). Sites sampled in Sheep Creek and Beaverdam Creek were both below point sources of exposure, as these waterways drain a mine site near Grande Cache; however, only liver Se concentrations in fish from Sheep Creek were above Lemly's threshold. The Muskeg and Smoky Rivers are larger waterways and collect water from a relatively larger area of undisturbed watershed. Selenium levels are somewhat lower in fish collected from these two rivers. It is interesting to note that liver Se concentrations in fish from the Muskeg River were slightly above Lemly's threshold as the samples are from a population above a barrier falls. Additionally, it is important to remember that samples from the Smoky River are from fish with differing exposure levels based on individual movement patterns and residency.

Tissue selenium concentrations in brook trout from the control sites, Cold Creek and Fairfax Lake, were below Lemly's thresholds (Figure 4). Selenium levels in the livers of brook trout from the four streams draining areas with surface mining disturbance (e.g., rock dumps, rock drains) were far above Lemly's threshold values. Levels of Se in the ovaries of brook trout from the McLeod River downstream of Luscar Creek were particularly high, ranging between 5.1 and 15.8 µg/g wet weight. Levels of Se in brook trout tissue from the Muskeg River were below Lemly's thresholds.

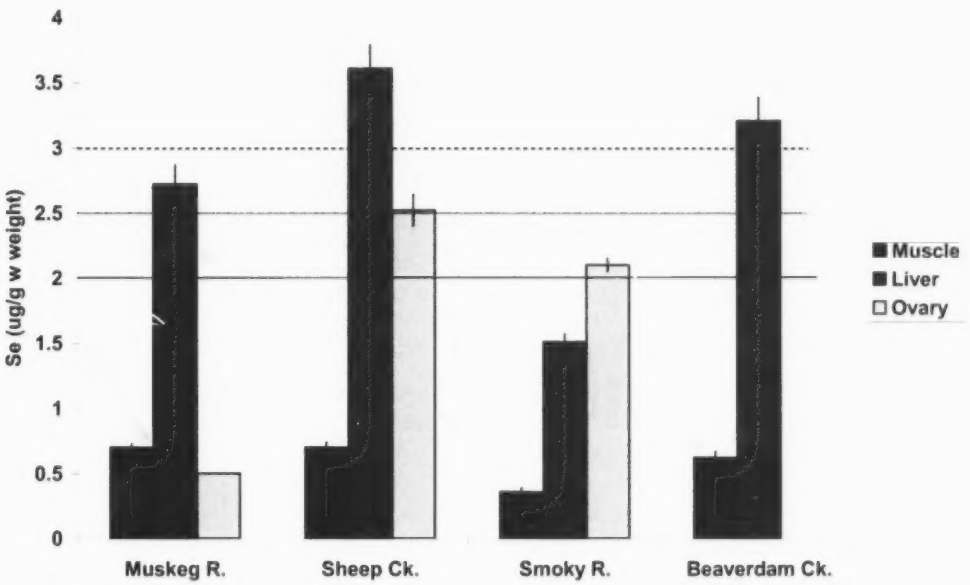

Figure 3 Selenium concentrations in tissues of bull trout

Data were collected between late September and late October, 2000. n values range from 7 (Smoky River) to 12 (all others) for muscle and liver and from 1 (Muskeg River) to 8 for ovaries. Vertical bars represent ± 1 SEM. Horizontal lines represent tissue thresholds for selenium as defined by Lemly (1996) converted to wet weight assuming a water content of 75%. Dark line is for muscle, light line for ovary/eggs and the dashed line is for liver.

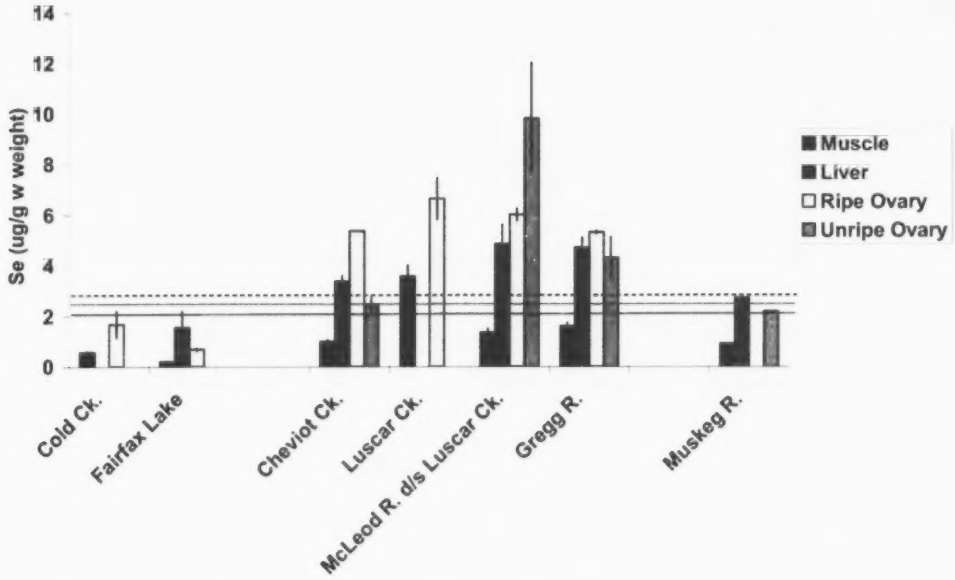

Figure 4 Selenium concentrations in tissues of brook trout

Data were collected between late September and December 2000. n values range from 1 (Muskeg River) to 18 (Luscar Creek) for muscle and from 1 (Muskeg River) to 11 for ovaries. Vertical bars represent ± 1 SEM. Horizontal lines represent tissue thresholds for selenium as defined by Lemly (1996) converted to wet weight assuming a water content of 75%. Dark line is for muscle, light line for ovary/eggs and the dashed line is for liver.

Selenium concentrations in rainbow trout muscle were generally below Lemly's thresholds for toxic effects in all waters sampled (Figure 5). However, Se concentrations in liver and gonad tissues were well above Lemly's thresholds for toxic effects in some of the reference samples and in fish tissues from all of the streams draining mine sites. Among the reference sites, liver Se levels were considerably lower in fish from Whitehorse Creek and Fairfax Lake than in fish from MacKenzie Creek. Two fish from MacKenzie Creek had high Se levels in both liver and gonad tissues and may have been migrants from areas in the McLeod River with higher waterborne Se concentrations. Selenium levels in the unripe ovaries of rainbow trout from the Muskeg and Smoky rivers were lower than those of fish from reference streams (Whitehorse and MacKenzie creeks) in the upper McLeod system.

Selenium levels in the tissues of longnose sucker from the McLeod and Smoky rivers were below Lemly's thresholds (Figure 6). However ovary (n=2) and liver (n=6) selenium levels in Arctic grayling from the Smoky River were above Lemly's thresholds (Figure 6).

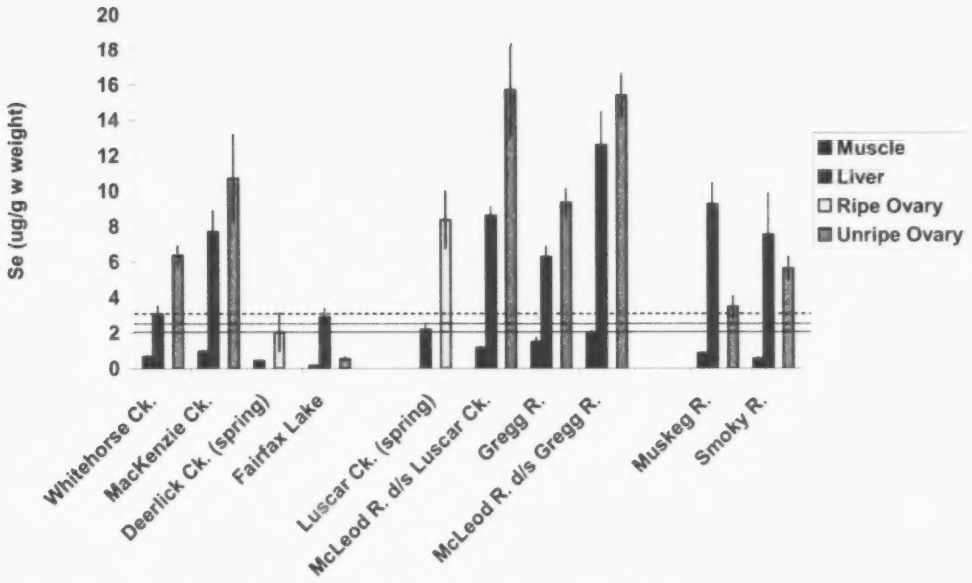

Figure 5 Selenium concentrations in tissues of rainbow trout

Data were collected in 2000. Ripe ovary tissues from Deerlick and Luscar creeks were collected in the spring as part of the DFO bioassay studies. n values range from 4 (Whitehorse Creek) to 17 for muscle and from 2 (Smoky River) to 6 for ovaries. Vertical bars represent ± 1 SEM. Horizontal lines represent tissue thresholds for selenium as defined by Lemly (1996) converted to wet weight assuming a water content of 75%. Dark line is for muscle, light line for ovary/eggs and the dashed line is for liver.

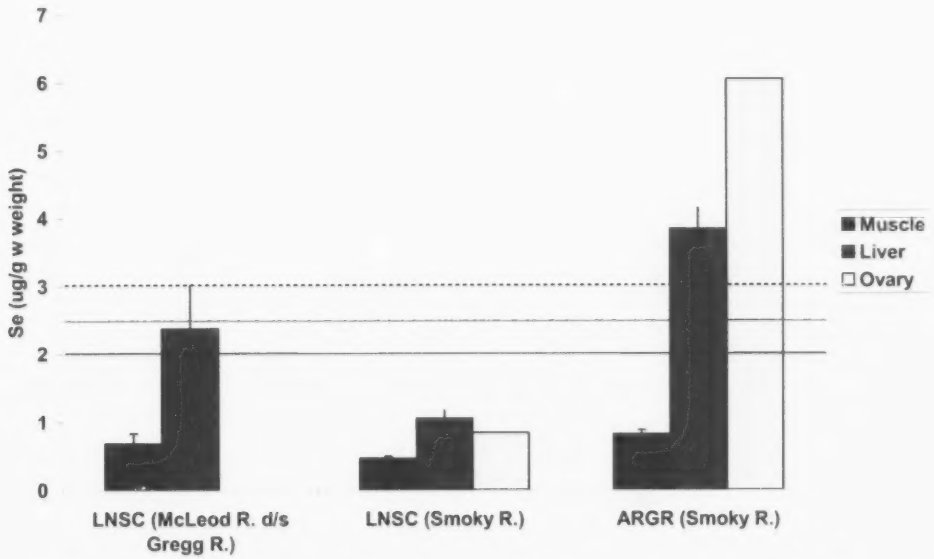

Figure 6 Selenium concentrations in tissues of Arctic grayling (ARGR) and longnose sucker (LNSC)

Data were collected in 2000. n values range from 2 (LNSC in McLeod River) to 11 (LNSC in Smoky River) for muscle and liver, and from 2 (ARGR in Smoky River) to 7 for ovaries. Vertical bars represent ± 1 SEM. Horizontal lines represent tissue thresholds for selenium as defined by Lemly (1996) converted to wet weight assuming a water content of 75%. Dark line is for muscle, light line for ovary/eggs and the dashed line is for liver.

Selenium concentrations in muscle plugs of fish collected in 2001 from the reference sites were approximately one-quarter Lemly's threshold values for toxic effects (Figure 7). All species from Luscar Creek, mountain whitefish and rainbow trout from the McLeod River downstream of Luscar Creek, and mountain whitefish from the Gregg River were at or above Lemly's threshold for toxic effects (Figure 7).

When selenium concentrations in muscle tissue are compared across years for bull trout, Arctic grayling and longnose sucker, only bull trout collected from Luscar Creek in 2001 are near Lemly's threshold for toxic effects (Figure 8).

Selenium concentrations in the muscle of mountain whitefish were higher on average in 2001 than in 2000 in all fish in the three locations (Luscar Creek, McLeod River downstream of Luscar Creek, and Gregg River) sampled in both years (Figure 9).

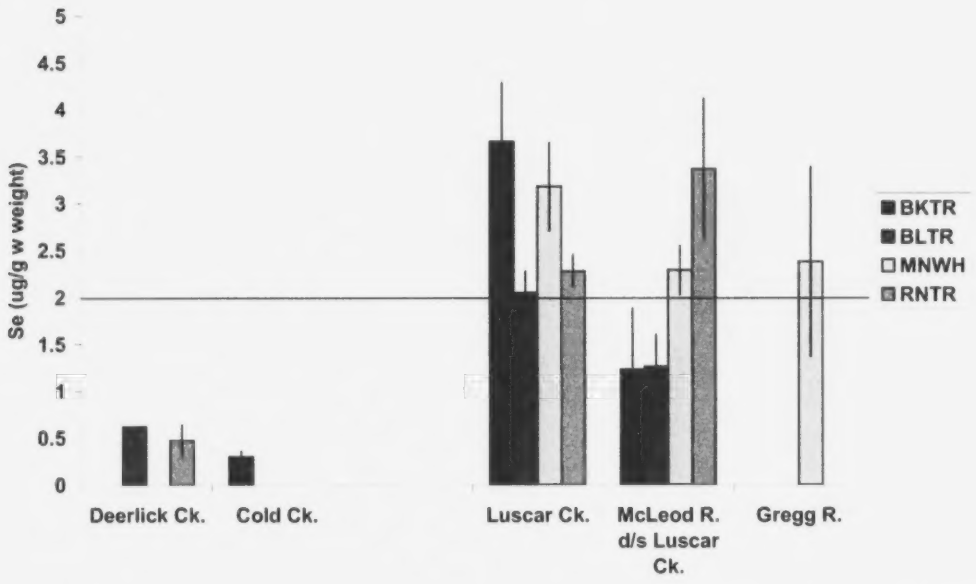

Figure 7 Selenium concentrations in muscle tissue of brook trout (BKTR), bull trout (BLTR), mountain whitefish (MNWH) and rainbow trout (RNTR) in 2001

Deerlick and Cold Creek are reference streams. n values range from 1 (Deerlick Creek BLTR) to 10 (Deerlick RNTR, Cold BKTR, Luscar BLTR, McLeod MNWH). Vertical bars represent ± 1 SEM. Horizontal line represents muscle tissue threshold for selenium as defined by Lemly (1996) converted to wet weight assuming a water content of 75%.

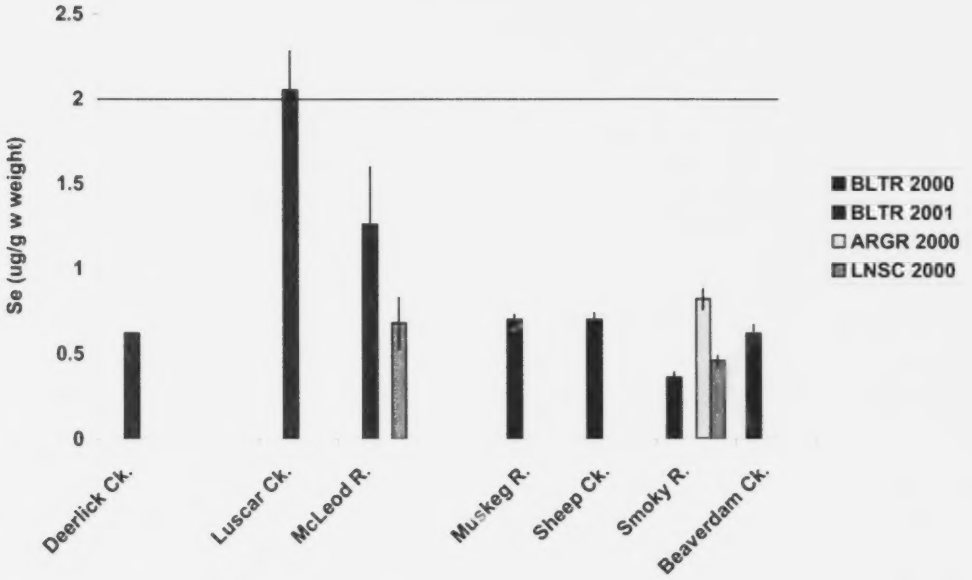

Figure 8 Between year comparisons of selenium concentrations in the muscle of bull trout (BLTR), longnose suckers (LNSC), and Arctic grayling (ARGR) collected in 2000 and 2001

Deerlick Creek is a reference stream. n values range from 2 (BLTR and LNSC in McLeod River) to 12 (BLTR in Muskeg River, and Sheep and Beaverdam Creeks). Vertical bars represent ± 1 SEM. Horizontal line represents muscle tissue threshold for selenium as defined by Lemly (1996) converted to wet weight assuming a water content of 75%.

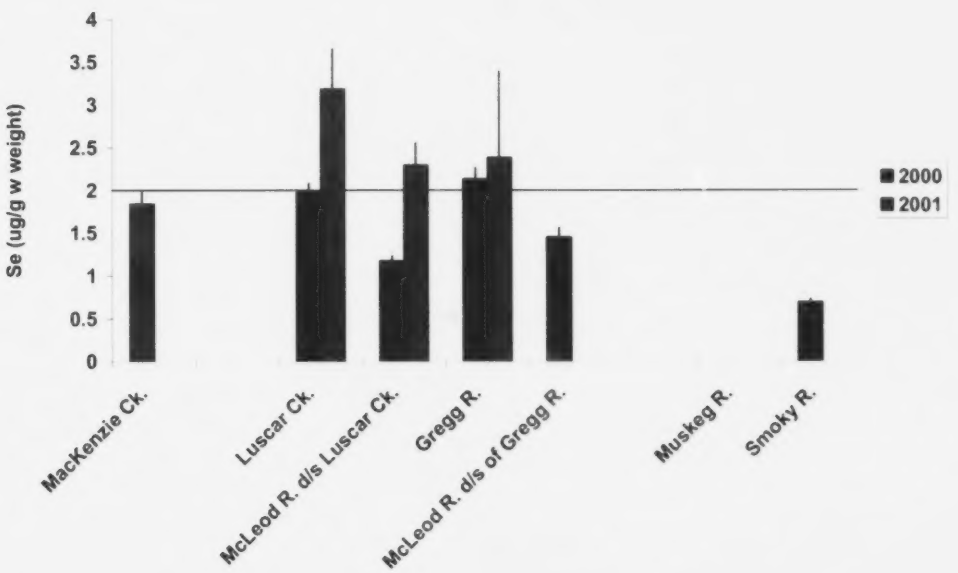

Figure 9 Between years comparison of selenium concentrations in the muscle of mountain whitefish collected in 2000 and 2001

MacKenzie Creek is a reference stream; all others are in areas exposed to waterborne Se to varying degrees. n values range from 14 (Luscar Creel and McLeod River in 2000) to 4 (Gregg River in 2001). Vertical bars represent ± 1 SEM. Horizontal line represents muscle tissue threshold for selenium as defined by Lemly (1996) converted to wet weight assuming a water content of 75%.

Selenium concentrations in brook trout muscle from Luscar Creek were above Lemly's threshold level in both 2000 and 2001 (Figure 10).

Selenium concentrations in the muscle of rainbow trout were above Lemly's threshold values in: Lac des Roches (1999); Luscar Creek (1999, 2000 and 2001); and the McLeod River downstream of Luscar Creek (2001) (Figure 11). Muscle selenium levels in rainbow trout from the Gregg River and the McLeod River downstream of the confluence with the Gregg River were elevated in comparison to reference sites, but below Lemly's threshold value (Figure 11).

Selenium concentrations in the ovaries of rainbow trout were above Lemly's threshold values at the majority of sites sampled, with the exception of the reference locations Wampus and Deerlick creeks, and Fairfax Lake (Figure 12). Selenium levels in ovary tissue of rainbow trout from Wampus Creek (upper McLeod River basin) were significantly higher than those from Fairfax Lake (Pembina River basin).

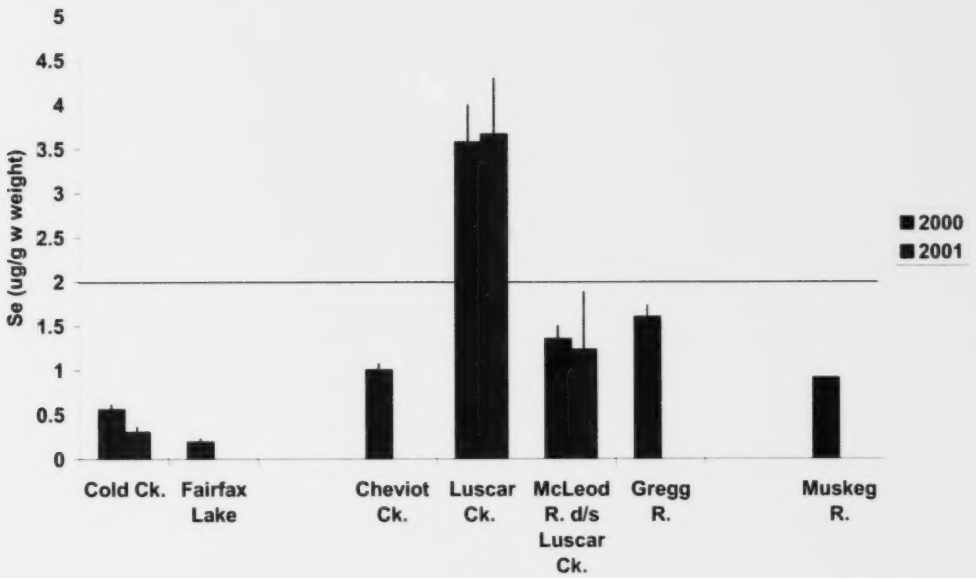

Figure 10 Between years comparison of selenium concentrations in the muscle of brook trout collected in 2000 and 2001

Cold Creek and Fairfax Lake are reference sites; all other sampling locations are in areas exposed to waterborne Se to varying degrees. n values range from 18 (Luscar Creek in 2000) to 1 (Muskeg River in 2000). Vertical bars represent ± 1 SEM. Horizontal line represents muscle tissue threshold for selenium as defined by Lemly (1996) converted to wet weight assuming a water content of 75%.

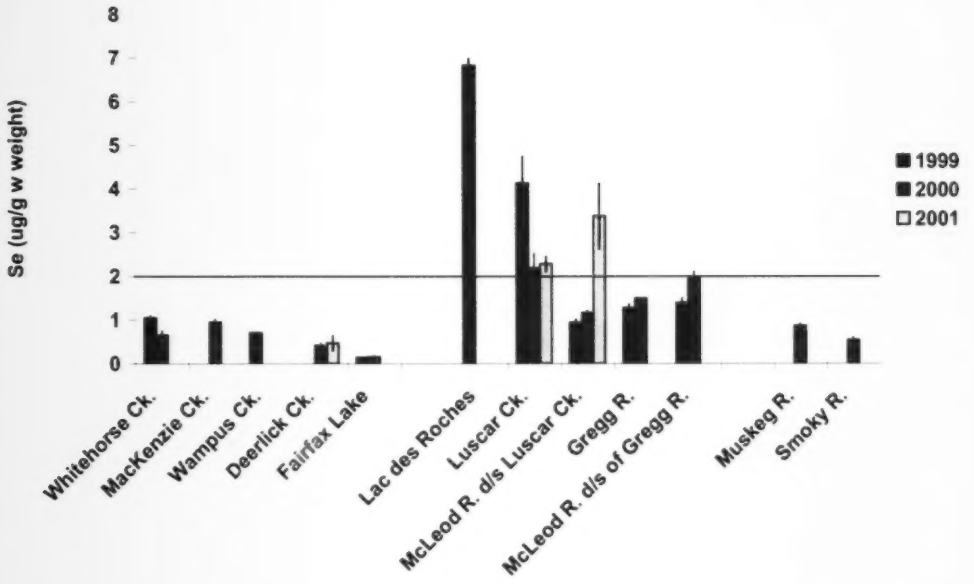

Figure 11 Between years comparison of selenium concentrations in the muscle of rainbow trout collected from 1999 through 2001

Whitehorse, MacKenzie, Wampus, and Deerlick creeks, Fairfax Lake, and the Muskeg River are reference locations; all others are in areas exposed to waterborne Se to varying degrees. n values range from 2 (McLeod River downstream of confluence with Gregg R., 1999) to 25 (Muskeg R., 2000). Vertical bars represent ± 1 SEM. Horizontal line represents muscle tissue threshold for selenium as defined by Lemly (1996) converted to wet weight assuming a water content of 75%.

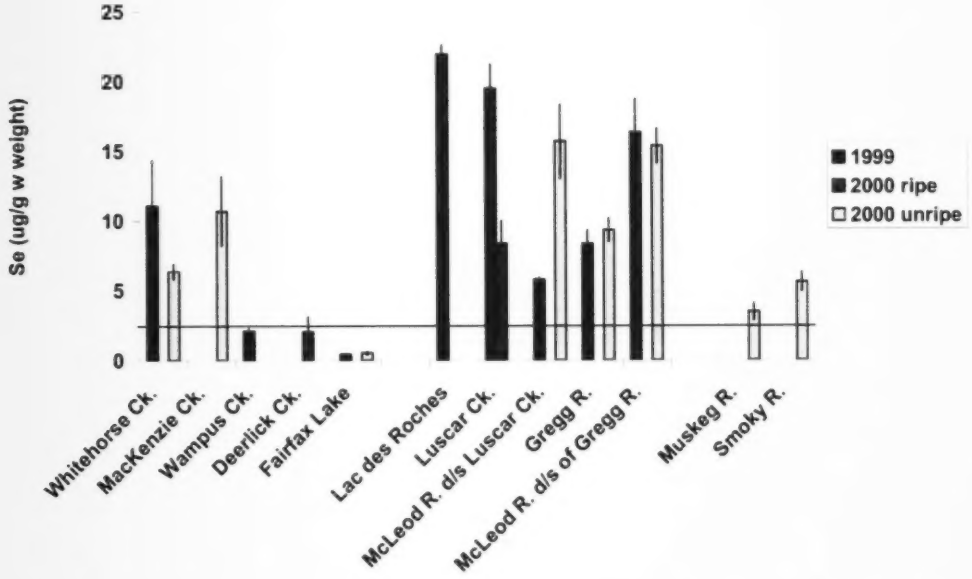

Figure 12 Between years comparison of selenium concentrations in the ovaries of rainbow trout collected in 1999 and 2000

Whitehorse, MacKenzie, Wampus, and Deerlick creeks, Fairfax Lake and the Muskeg River are reference locations; all others are in areas exposed to waterborne Se to varying degrees. n values range from 2 (Fairfax Lake, 2000 and Smoky R.) to 19 (Lac des Roches, 1999). Vertical bars represent ± 1 SEM. Horizontal line represents ovary tissue threshold for selenium as defined by Lemly (1996) converted to wet weight assuming a water content of 75%.

3.1 Summary of Results

3.1.1 Selenium in Muscle Tissue for All Species

In order to present an overall picture of these results, a qualitative summary of muscle selenium concentrations is provided in Table 2. To construct the table, qualitative estimates were made of the extent to which muscle selenium levels fell above or below Lemly's threshold value for selenium in muscle. A score of ++++ indicates muscle selenium levels that far exceed the threshold value. Conversely, a score of ---- indicates a level of muscle selenium that is far below the threshold level.

The results of the present study show that selenium levels in fish muscle tissue were noticeably higher in samples collected downstream of the two mining areas in the upper McLeod River basin in comparison to the mining area in the upper Smoky River basin and the reference locations

In general, muscle selenium levels were low (-) to extremely low (----) in fish from the reference water bodies, and from exposed sites in the Grande Cache area. However, selenium levels in muscle were high (+) to extremely high (++++) in fish sampled from waters draining the Luscar and Gregg River mines in the upper McLeod River basin. Extremely high levels were observed for rainbow trout muscle samples from fish collected in Lac des Roches and Luscar Creek.

3.1.2 Selenium in Muscle, Liver, and Ovary Tissue

A similar qualitative summary of the selenium concentrations in muscle, liver and ovary tissues of the four most sampled species (rainbow trout, brook trout, bull trout, and mountain whitefish) collected at the same sites and years was compiled and is presented in Table 3. These results produce a more complicated picture. For fish that were sampled from waters draining the Luscar and Gregg River mines in the upper McLeod River basin, and the mine site in the upper Smoky River system, levels of selenium exceeded Lemly's threshold value in both liver and ovary tissues. However selenium levels were elevated in liver and ovary of fish collected from some of the reference locations as well.

Table 2 Summary of results for selenium levels in fish muscle tissue

'+' indicates levels above the threshold value, '-' indicates levels below threshold. Different values in a single cell represent different years. Reference sites are shown in italics. Data were only obtained for cells in which there are '-' or '+' symbols.

Fish Species Sample Site	Rainbow Trout	Brook Trout	Bull Trout	Mountain Whitefish	Arctic Grayling	Longnose Sucker
Upper Smoky River System						
Smoky River	- - -		- - -	- -	- -	- - -
Sheep Creek			- -			
Beaverdam Creek			- -			
Muskeg River	- - -	- -	- -			
Upper McLeod River System						
Cheviot Creek		- -				
Whitehorse Creek	- - - - - -					
Luscar Creek	++++ +, +	++ +++	+ +	- ++		
Upper McLeod River	-, - ++	- - -	- - - -	- +		- - -
MacKenzie Creek	- - -			-		
Deerlick Creek	- - - - - -		- -			
Wampus Creek	- - -					
Gregg River	- -	-		+ +		
Middle McLeod River	- -	- -		-		- -
Maskuta Creek (Tributary of Athabasca River)						
Cold Creek		- - - - - - -				
Lakes (McLeod River Basin except Fairfax Lake)						
Fairfax Lake	- - - - - - - -	- - - -				
Lac des Roches	++++					

Table 3 Summary of selenium concentrations in muscle (M), liver (L), and ovary (O) tissues of the four most sampled fish species
See Table 2 for explanation of symbols used.

Sample Site	Rainbow Trout			Brook Trout			Bull Trout			Mountain Whitefish		
	M	L	O	M	L	O	M	L	O	M	L	O
Upper Smoky River System												
Smoky River		++	++				---	-	-	--	+++	+++
Sheep Creek							---	+	+			
Beaverdam Creek							---	+				
Muskeg River	--	+++	+, --	--	-	-	---	+	---			
Upper McLeod River System												
Cheviot Creek				--	+	+++						
Whitehorse Creek	---	-	++									
Luscar Creek	+		+++	+		+++				+	+++	+++
Upper McLeod River	--		++++	--	++	++++				-	+++	+++
MacKenzie Creek	---	+++	+++							-	+++	+++
Deerlick Creek	---		-									
Gregg River	-	++	+++	-	++	++				+		
Middle McLeod River	-	++	++++							-	+++	+++
Maskuta Creek (Tributary of Athabasca River)												
Cold Creek				---	--							
Lakes (McLeod River Basin except Fairfax Lake)												
Fairfax Lake	---	-	---	---	--	--						

4.0 DISCUSSION

Tissue selenium levels of fish collected from waters draining the Luscar and Gregg River mine sites were up to three or four times the threshold levels for selenium defined by Lemly (1996) for aquatic organisms. Selenium levels were above threshold in muscle, liver, and ovary of fish collected from all areas with elevated waterborne selenium concentrations. Selenium levels in liver and ovary were relatively more elevated than muscle selenium levels. These results indicate that there is potential for reproductive success to be impaired in fish from the Se-affected waters.

Selenium levels in liver and ovary were also above Lemly's threshold in some species of fish collected from three of the reference streams: Muskeg River (bull trout liver, rainbow trout liver and ovary); MacKenzie Creek (mountain whitefish liver and ovary, rainbow trout liver and ovary); and Whitehorse Creek (rainbow trout ovary). The Muskeg River drains an area undisturbed by surface mining; however, there is a historic ash disposal site near its mouth. Also, fish collected in the Muskeg River would have access to the Smoky River and Sheep Creek, as these confluences are relatively close to each other (Figure 1b). Although Whitehorse and MacKenzie creeks drain areas undisturbed by surface mining, they are within the upper McLeod River drainage basin. Bull trout and mountain whitefish are fall spawners and were sampled in Whitehorse and MacKenzie creeks during their spawning migrations. This could explain the higher levels seen in bull trout and rainbow trout collected at these sites. MacKenzie Creek is a tributary of the McLeod River downstream of the confluence of Luscar Creek with the McLeod River, and Whitehorse Creek enters the McLeod River upstream of the Luscar Creek confluence. It is possible that the fish sampled in MacKenzie and Whitehorse creeks were not residents, but rather had spent most of their lives in the McLeod River and had migrated into these reference creeks to spawn.

Liver and ovary selenium levels from mountain whitefish were well above Lemly's threshold values for all fish sampled (Figure 2). The extensive migrations of this species likely explains the higher selenium concentrations in its tissues and precludes the use of this species as an indicator species for selenium levels in small headwater systems.

Selenium levels in rainbow trout ovary tissues collected at sites downstream from the Luscar and Gregg River mines were, on average, four times Lemly's threshold value (Figure 5).

In the present study, muscle selenium levels were generally below Lemly's threshold for deleterious effects with two exceptions, the waters draining the Luscar and Gregg River mines. The extremely high levels of selenium observed in fish tissues from these two drainages may be cause for concern. This is because of the potential for high selenium levels to have deleterious effects on embryonic development.

Muscle selenium levels were well above threshold levels in rainbow trout, brook trout, and bull trout collected from waters draining the Luscar Mine. Muscle selenium levels were above threshold levels in mountain whitefish collected from waters draining the Gregg River mine. Muscle selenium levels of rainbow trout and brook trout collected from the Gregg River, down stream of the Gregg River mine were not above Lemly's threshold for deleterious effects, but

were significantly higher than reference levels. There is no obvious explanation for why muscle selenium levels were relatively low in rainbow and brook trout collected from the Gregg River. It is possible that the individuals collected had not been long time residents, i.e., recent migrants and/or of young age.

The results from mountain whitefish for 2000 suggest that all of the fish had similar exposure to selenium in the environment. However, in 2001, muscle selenium levels were elevated in mountain whitefish (Figure 8) from three waterways that drain mine sites (Luscar Creek, McLeod River downstream of Luscar Creek, and Gregg River). Liver and gonad selenium levels of mountain whitefish were above threshold values in all populations sampled. One possible explanation is that they had been feeding downstream of selenium inputs and then migrated up to the sampling locations during their extensive fall spawning migration. All of the mountain whitefish sampled in 2000 were collected in the fall when they would be expected to be furthest upstream in the watersheds they inhabit.

Selenium levels were well above the threshold for deleterious effects in the liver and gonad of brook trout from streams in drainages associated with mines compared to fish from reference sites (Figure 4). Selenium levels were below threshold in all tissues of brook trout from reference sites.

The interpretation of the data gathered in the present study rests on assumptions with regard to fish movement. For example, the elevated selenium levels found in the tissues of some fish from reference streams could be explained if the fish sampled were migratory. It is certainly possible that some fish could have moved up reference streams, such as MacKenzie and Whitehorse creeks from the McLeod River. Both MacKenzie and Whitehorse creeks drain into the McLeod River. Generally, upstream migrations of rainbow trout occur in spring prior to spawning. However, the rainbow trout from MacKenzie and Whitehorse creeks that had elevated ovary selenium levels were collected in mid-October, not a time one would expect rainbow trout to undergo upstream spawning migrations.

5.0 LITERATURE CITED

Alberta Environment. 2000. Surface water quality guidelines for use in Alberta. Environmental Sciences Division and Water Management Division, Alberta Environment. Edmonton, Alberta. 20 p. (http://www3.gov.ab.ca/env/protenf/publications/SurfWtrQual-Nove99.pdf

Besser, J.M., T.J. Canfield, and T.W. LaPoint. 1993. Bioaccumulation of organic and inorganic selenium in a laboratory food chain. Environmental Toxicology and Chemistry 12: 57-72.

Casey, R. and P. Siwik. 2000. Concentrations of selenium in surface waters, sediment and fish from the McLeod, Pembina and Smoky Rivers: Results of Surveys from Fall 1998 to Fall 1999. Interim Report. Alberta Environment, Natural Resources Services. Available at: http://www3.gov.ab.ca/env/water/reports/Concentrations_of_Selenium_Interim_Report.pdf

Culp, J.M., I. Boyd and N.E. Glozier. 1988. An improved method for obtaining gut contents from small live fished by anal and stomach flushing. Copeia 4: 1079-1082.

Hodson, P.V., D.J. Spry and B.R. Blunt. 1980. Effects on rainbow trout (*Salmo gairdneri*) of a chronic exposure to waterborne selenium. Canadian Journal of Fisheries and Aquatic Sciences. 37: 233-240.

Hodson, P.V. and J.W. Hilton. 1983. The nutritional requirements and toxicity to fish of dietary and waterborne selenium. In: Environmental Biogeochemistry, R. Hallberg ed. Ecological Bulletin 35:335-340.

Holm, J. 2002. Sublethal effects of selenium on rainbow trout (*Oncorhynchus mykiss*) and brook trout (*Salvelinus fontinalis*). M.Sc. thesis. Published by the Department of Zoology, University of Manitoba, Winnipeg, Manitoba.

Holm, J., V. Palace, P. Siwik, G. Sterling, R. Evans, C. Baron, J. Werner and K. Wautier . 2005. Developmental effects of bioaccumulated selenium in eggs and larvae of two salmonid species. Environmental Toxicology and Chemistry. 24: 2373-2381.

Lemly, A.D. 1993. Metabolic stress during winter increases the toxicity of selenium to fish. Aquatic Toxicology 27:133-158.

Lemly, A.D. 1996. Selenium in aquatic organisms. Chapter 19, pages 427-458. IN: Eds. W.N Beyer, G.H. Heinz and A.W. Redmon-Norwood. Environmental contaminants in Wildlife. Interpreting tissue concentrations. Lewis Publishers, New York.

Lemly, A.D. 1997a. A teratogenic deformity index for evaluating impacts of Se on fish populations. Ecotoxicology and Environmental Safety. 37: 259-266.

Lemly, A.D. 1997b. Environmental implications of excessive selenium: a review. Biomedical and Environmental Safety 37: 259-266.

Meehan, W.R. and R.A. Miller. 1978. Stomach flushing: effectiveness and influence on survival and condition of juvenile salmonids. J. Fish. Res. Board Can. 35: 1359-1363.

Nelson, J.S. and M.J. Paetz. 1992. The fishes of Alberta. 2nd ed. University of Alberta Press. Edmonton. 437 pages.

Newman, M. 1995. Quantitative Methods in Aquatic Ecotoxicology. CRC Press. Boca Raton, Florida. 426 pp.

Prince, A. and C. Powell. 2000. Clove oil as an anesthetic for invasive field procedures on adult rainbow trout. North American Journal of Fisheries Management 20: 1029-1032.

Stantec Consulting Ltd. 2004. Fish diet analysis – McLeod and Smoky River drainages. Prepared for Alberta Environment by Stantec Consulting Ltd., Calgary, Alberta.

Zar, J.H. 1984. Biostatistical Analysis. 2nd Edition. Prentice-Hall Inc. Englewood Cliffs, New Jersey.

6.0 BIBLIOGRAPHY OF REFERENCES PERTINENT TO THIS STUDY

Baumann, Paul C. and Robert B. Gillespie. (1986). Selenium bioaccumulation in gonads of largemouth bass and bluegill from three power plant cooling reservoirs. *Environmental Toxicology and Chemistry*, 5:695-701.

Besser, J.M., J.P. Giesy, R.W. Brown, J.M. Buell, and G.A. Dawson. 1996. Selenium bioaccumulation and hazards in a fish community affected by coal fly ash effluent. Ecotoxicology and Environmental Safety. 35: 7-15.

Crane, Mark, Tim Flower, Dawn Holmes and Samantha Watson. (1992). The toxicity of selenium in experimental freshwater ponds. *Archives of Environmental Contamination and Toxicology*, 23:440-452.

Fitzsimons, John D., Susan Huestis and Bill Williston. (1995). Occurrence of a swim-up syndrome in Lake Ontario Lake Trout in relation to contaminants and cultural practices. *Journal of Great Lakes Research*, 21(Supplement 1):277-285.

Gillespie, Robert B and Paul C. Baumann. (1986). Effects of high tissue concentrations of selenium on reproduction by bluegills. *Transactions of the American Fisheries Society*, 115:208-213.

Hall, Lenwood W., Jr. Studies of striped bass in three Chesapeake Bay spawning habitats. *Marine Pollution Bulletin*, 19(9):478-487.

Hamilton, S. J. and B. Waddell. (1994). Selenium in eggs and milt of razorback sucker (Xyrauchen texanus) in the Middle Green River, Utah. *Archives of Environmental Contamination and Toxicology*, 27:195-201

Hanson, Peter, J. (1997). Response of hepatic trace element concentrations in fish exposed to elemental and organic contaminants. *Estuaries*, 20(4):659-676.

Kasier. Ivan I. Patricia A. Young and Jerry D. Johnson. (1979). Chronic exposure of trout to waters with naturally high selenium levels: effect on transfer RNA methylation. *Journal of the Fisheries Research Board of Canada*, 36: 689-694.

Lemly, A. Dennis. (1985). Toxicology of selenium in a freshwater reservoir: implications for environmental Hazard evaluation and safety. *Ecotoxicology and Environmental Safety*, 10:314-338.

Lemly, A. Dennis. (1993). Teratogenic effects of selenium in natural populations of freshwater fish. *Ecotoxicology and Environmental Safety*, 26:181-204.

Lemly, A. Dennis. (1997). Ecosystem recovery following selenium contamination in a freshwater reservoir. *Ecotoxicology and Environmental Safety*, 36:275-281.

Nakamoto, Rodney J. and Thomas J. Hassler. (1992). Selenium and other trade elements in Bluegills from agricultural return flows in the San Joaquin Valley, California. *Archives of Environmental Contamination and Toxicology*, 22:88-98.

Pennington, C.H., John A. Baker and Michael E. Potter. (1982). Contaminant levels in fishes from Brown's Lake, Mississippi. *Journal of the Mississippi Academy of Science*, 17:139-147.

Phillips, Glenn R. and Richard W. Gregory. (1980). Accumulation of selected elements (AS, CU, HG, PB, SE, ZN) by northern pike (Esox lucius) reared in surface coal mine decant water. *Proceedings of the Montana Academy of Sciences*. 39:44-50.

Sager, David R. and Clarence R. Cofield. (1984). Differential accumulation of selenium among axial muscle, reproductive and liver tissues of four warmwater fish species. *Water Resources Bulletin*, 20(3): 359-363.

Saiki, Michael K. and Donald U. Palawski. (1990). Selenium and other elements in juvenile striped bass from the San Joaquin Valley and San Francisco Estuary, California. *Archives of Environmental Contamination and Toxicology*, 19:717-730.

Saiki, Michael K. and Thomas W. May. 1988. Trace element residues in bluegills and common carp from the lower San Joaquin River, California, and its tributaries. *The Science of the Total Environment*, 74:199-217

Saiki, Michael K., Mark R. Jennings and Thomas W. May. 1992. Selenium and other elements in freshwater fishes from the irrigated San Joaquin valley, California. *The Science of the Total Environment,* 126:109-137.

Saiki, Michael. (1987). Relation of length and sex to selenium concentration in mosquitofish. *Environmental Pollution*, 47:171-186.

Sorenson, Elsie M. B. and Thomas L. Bauer. (1984a). A correlation between selenium accumulation in sunfish and changes in condition factor and organ weight. *Environmental Pollution (Series A).* 34: 357-366.

Sorenson, Elsie M. B. and Thomas L. Bauer. (1984b). Planimetric analysis of redear sunfish (Lepomis microlophus) hepatopancreas following selenium exposure. *Environmental Toxicology and Chemistry*, 3: 159-165

Sorenson, Elsie M. B., Peter M. Cumbie, Thomas L. Bauer, James S. Bell and Charles W. Harlan. (1984c). Histopathological, hematological, condition-factor, and organ weight changes associated with selenium accumulation in fish from Belews Lake, North Carolina. *Archives of Environmental Contamination and Toxicology*, 13:153-162.

Sorenson, Elsie M.B. (1988). Selenium accumulation, reproductive status, and histopathological changes in environmentally exposed redear sunfish. *Archives of Toxicology*, 61:324-329.

Sorenson, Elsie M.B. Thomas L. Bauer, James S. Bell and Charles W. Harlan. (1982). Selenium accumulation and cytotoxicity in teleosts following chronic, environmental exposure. *Bulletin of Environmental Contamination and Toxicology*. 299:688-696.

Southworth, George R. Mark J. Peterson and Ralph R. Turner. (1994). Changes in concentrations of selenium and mercury in largemouth bass following elimination of fly ash and discharge to a quarry. *Chemosphere*, 29(1):71-79.

Stripp, R.A., M. Heit, D.C. Bogen, J. Bidanset and L. Trombetta. (1990). Trace element accumulation in the tissues of fish from lakes with different pH values. *Water, Air, and Soil Pollution*, 51:75-87.

Appendix I Selenium concentrations (µg/g wet weight) in fish tissues collected in west-central Alberta, 1999

										MUSCLE			
REF NO.	Water Body	Site Type	Legal Description	Sample Date	Spp.	Fork Lgth. (mm)	Total Wght. (g)	Age (ann.)	Mat.	ARC_REF Number	AEP_REF Number	Smp LinkID	Se (µg/g)
1	Fairfax Lake	REF	17-46-18-W5	18-May-99	RNTR	373	570	3	RpF	9902251	99SWE018-13	FX1M	0.150
2	Fairfax Lake	REF	17-46-18-W5	18-May-99	RNTR	330	380	2	RpF	9902253	99SWE018-15	FX2M	0.133
3	Fairfax Lake	REF	17-46-18-W5	18-May-99	RNTR	314	370	2	RpF	9902255	99SWE018-17	FX3M	0.137
4	Gregg River	EXP	6,7&8-49-24-W5	20-May-99	RNTR	202	90	5	GrF	9902231	99SWE017-93	GR1M	1.06
5	Gregg River	EXP	6,7&8-49-24-W5	20-May-99	RNTR	137	30	3	MgF	9902233	99SWE017-95	GR2M	1.42
6	Gregg River	EXP	6,7&8-49-24-W5	20-May-99	RNTR	126	20	3	MgF	9902235	99SWE017-97	GR3M	1.25
7	Gregg River	EXP	6,7&8-49-24-W5	20-May-99	RNTR	149	30	3	MgF	9902237	99SWE017-99	GR4M	1.87
8	Gregg River	EXP	6,7&8-49-24-W5	20-May-99	RNTR	114	10	3	MgF	9902239	99SWE018-01	GR5M	1.09
9	Gregg River	EXP	6,7&8-49-24-W5	20-May-99	RNTR	150	30	3	MgF	9902241	99SWE018-03	GR6M	1.13
10	Gregg River	EXP	6,7&8-49-24-W5	20-May-99	RNTR	133	20	3	MgF	9902243	99SWE018-05	GR7M	1.23
11	Gregg River	EXP	6,7&8-49-24-W5	20-May-99	RNTR	145	30	3	MgF	9902245	99SWE018-07	GR8M	0.997
12	Gregg River	EXP	6,7&8-49-24-W5	20-May-99	RNTR	143	20	3	MgF	9902247	99SWE018-09	GR9M	1.51
13	Gregg River	EXP	6,7&8-49-24-W5	20-May-99	RNTR	132	20	3	MgF	9902249	99SWE018-11	GR10M	1.18
14	Lac Des Roches	EXP	47-24-W5	26-May-99	RNTR	382	588	5	RpF	9902297	99SWE018-59	358M	6.43
15	Lac Des Roches	EXP	47-24-W5	26-May-99	RNTR	344	504	5	RpF	9902299	99SWE018-61	369M	6.95
16	Lac Des Roches	EXP	47-24-W5	28-May-99	RNTR	393	664	6	RpF	9902301	99SWE018-63	370M	7.27
17	Lac Des Roches	EXP	47-24-W5	26-May-99	RNTR	359	478	5	RpF	9902303	99SWE018-65	374M	6.30
18	Lac Des Roches	EXP	47-24-W5	26-May-99	RNTR	366	506	5	RpF	9902305	99SWE018-67	380M	7.12
19	Lac Des Roches	EXP	47-24-W5	26-May-99	RNTR	385	601	5	RpF	9902307	99SWE018-69	383M	6.63
20	Lac Des Roches	EXP	47-24-W5	26-May-99	RNTR	361	512	5	RpF	9902309	99SWE018-71	411M	6.76
21	Lac Des Roches	EXP	47-24-W5	26-May-99	RNTR	353	505	4	RpF	9902311	99SWE018-73	424M	6.72
22	Lac Des Roches	EXP	47-24-W5	26-May-99	RNTR	256	201	3	RpF	9902313	99SWE018-75	451M	7.36
23	Lac Des Roches	EXP	47-24-W5	26-May-99	RNTR	234	154	3	RpF	9902315	99SWE018-77	452M	7.05
24	Lac Des Roches	EXP	47-24-W5	26-May-99	RNTR	288	273	3	RpF	9902317	99SWE018-79	454M	7.19
25	Lac Des Roches	EXP	47-24-W5	26-May-99	RNTR	450	866	6	RpF	9902319	99SWE018-81	457M	8.01
26	Lac Des Roches	EXP	47-24-W5	26-May-99	RNTR	216	113	3	RpF	9902321	99SWE018-83	461M	5.52
27	Lac Des Roches	EXP	47-24-W5	26-May-99	RNTR	330	383	4	RpF	9902323	99SWE018-85	463M	6.81
28	Lac Des Roches	EXP	47-24-W5	26-May-99	RNTR	300	302	4	RpF	9902325	99SWE018-87	464M	5.77
29	Lac Des Roches	EXP	47-24-W5	28-May-99	RNTR	348	456	4	RpF	9902327	99SWE018-89	468M	7.86
30	Lac Des Roches	EXP	47-24-W5	28-May-99	RNTR	342	457	5	RpF	9902329	99SWE018-91	470M	7.60
31	Lac Des Roches	EXP	47-24-W5	28-May-99	RNTR	221	125	3	RpF	9902331	99SWE018-93	471M	6.44
32	Lac Des Roches	EXP	47-24-W5	28-May-99	RNTR	239	158	3	RpF	9902333	99SWE018-95	472M	5.80
33	Luscar Creek	EXP	16/17-47-23-W5	17-May-99	RNTR	316	400	6	GrF	9902194	99SWE017-56	LC1M	4.30
34	Luscar Creek	EXP	16/17-47-23-W5	17-May-99	RNTR	269	250	4	GrF	9902196	99SWE017-58	LC2M	3.48
35	Luscar Creek	EXP	16/17-47-23-W5	17-May-99	RNTR	252	210	4	GrF	9902198	99SWE017-60	LC3M	2.78
36	Luscar Creek	EXP	16/17-47-23-W5	26-May-99	RNTR	160	50	3	ImF	9902200	99SWE017-62	LC4M	3.00
37	Luscar Creek	EXP	16/17-47-23-W5	26-May-99	RNTR	173	60	3	MgF	9902204	99SWE017-66	LC7M	3.33
38	Luscar Creek	EXP	16/17-47-23-W5	26-May-99	RNTR	182	80	3	GrF	9902206	99SWE017-68	LC8M	4.72
39	Luscar Creek	EXP	16/17-47-23-W5	26-May-99	RNTR	164	40	3	MgF	9902208	99SWE017-70	LC9M	3.32
40	Luscar Creek	EXP	16/17-47-23-W5	26-May-99	RNTR	198	90	3	SpM	9902202	99SWE017-64	LC5M	9.34
41	Luscar Creek	EXP	16/17-47-23-W5	26-May-99	RNTR	159	40	3	RpM	9902203	99SWE017-65	LC6M	3.64
42	Luscar Creek	EXP	16/17-47-23-W5	26-May-99	RNTR	122	20	2	ImM	9902210	99SWE017-72	LC10M	3.40
43	M. McLeod River	EXP	10/15-50-23-W5	21-May-99	RNTR	194	80	3	MgF	9902224	99SWE017-86	MM1M	1.18
44	M. McLeod River	EXP	10/15-50-23-W5	21-May-99	RNTR	155	30	3	MgF	9902228	99SWE017-90	MM4M	1.23

Appendix I Selenium concentrations (µg/g wet weight) in fish tissues collected in west-central Alberta, 1999

REF NO.	Water Body	Site Type	Legal Description	Sample Date	Spp.	Fork Lgth. (mm)	Total Wght. (g)	Age (ann.)	Mat.	MUSCLE ARC_REF Number	MUSCLE AEP_REF Number	MUSCLE Smp LinkID	MUSCLE Se (µg/g)
1	Fairfax Lake	REF	17-46-18-W5	18-May-99	RNTR	373	570	3	RpF	9902251	99SWE018-13	FX1M	0.150
2	Fairfax Lake	REF	17-46-18-W5	18-May-99	RNTR	330	380	2	RpF	9902253	99SWE018-15	FX2M	0.133
3	Fairfax Lake	REF	17-46-18-W5	18-May-99	RNTR	314	370	2	RpF	9902255	99SWE018-17	FX3M	0.137
4	Gregg River	EXP	6,7&8-49-24-W5	20-May-99	RNTR	202	90	5	GrF	9902231	99SWE017-93	GR1M	1.06
5	Gregg River	EXP	6,7&8-49-24-W5	20-May-99	RNTR	137	30	3	MgF	9902233	99SWE017-95	GR2M	1.42
6	Gregg River	EXP	6,7&8-49-24-W5	20-May-99	RNTR	126	20	3	MgF	9902235	99SWE017-97	GR3M	1.25
7	Gregg River	EXP	6,7&8-49-24-W5	20-May-99	RNTR	149	30	3	MgF	9902237	99SWE017-99	GR4M	1.87
8	Gregg River	EXP	6,7&8-49-24-W5	20-May-99	RNTR	114	10	3	MgF	9902239	99SWE018-01	GR5M	1.09
9	Gregg River	EXP	6,7&8-49-24-W5	20-May-99	RNTR	150	30	3	MgF	9902241	99SWE018-03	GR6M	1.13
10	Gregg River	EXP	6,7&8-49-24-W5	20-May-99	RNTR	133	20	3	MgF	9902243	99SWE018-05	GR7M	1.23
11	Gregg River	EXP	6,7&8-49-24-W5	20-May-99	RNTR	145	30	3	MgF	9902245	99SWE018-07	GR8M	0.997
12	Gregg River	EXP	6,7&8-49-24-W5	20-May-99	RNTR	143	20	3	MgF	9902247	99SWE018-09	GR9M	1.51
13	Gregg River	EXP	6,7&8-49-24-W5	20-May-99	RNTR	132	20	3	MgF	9902249	99SWE018-11	GR10M	1.18
14	Lac Des Roches	EXP	47-24-W5	26-May-99	RNTR	382	588	5	RpF	9902297	99SWE018-59	358M	6.43
15	Lac Des Roches	EXP	47-24-W5	26-May-99	RNTR	344	504	5	RpF	9902299	99SWE018-61	369M	6.95
16	Lac Des Roches	EXP	47-24-W5	28-May-99	RNTR	393	664	6	RpF	9902301	99SWE018-63	370M	7.27
17	Lac Des Roches	EXP	47-24-W5	26-May-99	RNTR	359	478	5	RpF	9902303	99SWE018-65	374M	6.30
18	Lac Des Roches	EXP	47-24-W5	26-May-99	RNTR	366	506	5	RpF	9902305	99SWE018-67	380M	7.12
19	Lac Des Roches	EXP	47-24-W5	26-May-99	RNTR	385	601	5	RpF	9902307	99SWE018-69	383M	6.63
20	Lac Des Roches	EXP	47-24-W5	26-May-99	RNTR	361	512	5	RpF	9902309	99SWE018-71	411M	6.76
21	Lac Des Roches	EXP	47-24-W5	26-May-99	RNTR	353	505	4	RpF	9902311	99SWE018-73	424M	6.72
22	Lac Des Roches	EXP	47-24-W5	26-May-99	RNTR	256	201	3	RpF	9902313	99SWE018-75	451M	7.36
23	Lac Des Roches	EXP	47-24-W5	26-May-99	RNTR	234	154	3	RpF	9902315	99SWE018-77	452M	7.05
24	Lac Des Roches	EXP	47-24-W5	26-May-99	RNTR	288	273	3	RpF	9902317	99SWE018-79	454M	7.19
25	Lac Des Roches	EXP	47-24-W5	26-May-99	RNTR	450	866	6	RpF	9902319	99SWE018-81	457M	8.01
26	Lac Des Roches	EXP	47-24-W5	26-May-99	RNTR	216	113	3	RpF	9902321	99SWE018-83	461M	5.52
27	Lac Des Roches	EXP	47-24-W5	26-May-99	RNTR	330	383	4	RpF	9902323	99SWE018-85	463M	6.81
28	Lac Des Roches	EXP	47-24-W5	26-May-99	RNTR	300	302	4	RpF	9902325	99SWE018-87	464M	5.77
29	Lac Des Roches	EXP	47-24-W5	28-May-99	RNTR	348	456	4	RpF	9902327	99SWE018-89	468M	7.86
30	Lac Des Roches	EXP	47-24-W5	28-May-99	RNTR	342	457	5	RpF	9902329	99SWE018-91	470M	7.60
31	Lac Des Roches	EXP	47-24-W5	28-May-99	RNTR	221	125	3	RpF	9902331	99SWE018-93	471M	6.44
32	Lac Des Roches	EXP	47-24-W5	28-May-99	RNTR	239	158	3	RpF	9902333	99SWE018-95	472M	5.80
33	Luscar Creek	EXP	16/17-47-23-W5	17-May-99	RNTR	316	400	6	GrF	9902194	99SWE017-56	LC1M	4.30
34	Luscar Creek	EXP	16/17-47-23-W5	17-May-99	RNTR	269	250	4	GrF	9902196	99SWE017-58	LC2M	3.48
35	Luscar Creek	EXP	16/17-47-23-W5	17-May-99	RNTR	252	210	4	GrF	9902198	99SWE017-60	LC3M	2.78
36	Luscar Creek	EXP	16/17-47-23-W5	26-May-99	RNTR	160	50	3	ImF	9902200	99SWE017-62	LC4M	3.00
37	Luscar Creek	EXP	16/17-47-23-W5	26-May-99	RNTR	173	60	3	MgF	9902204	99SWE017-66	LC7M	3.33
38	Luscar Creek	EXP	16/17-47-23-W5	26-May-99	RNTR	182	80	3	GrF	9902206	99SWE017-68	LC8M	4.72
39	Luscar Creek	EXP	16/17-47-23-W5	26-May-99	RNTR	164	40	3	MgF	9902208	99SWE017-70	LC9M	3.32
40	Luscar Creek	EXP	16/17-47-23-W5	26-May-99	RNTR	198	90	3	SpM	9902202	99SWE017-64	LC5M	9.34
41	Luscar Creek	EXP	16/17-47-23-W5	26-May-99	RNTR	159	40	3	RpM	9902203	99SWE017-65	LC6M	3.64
42	Luscar Creek	EXP	16/17-47-23-W5	26-May-99	RNTR	122	20	2	ImM	9902210	99SWE017-72	LC10M	3.40
43	M. McLeod River	EXP	10/15-50-23-W5	21-May-99	RNTR	194	80	3	MgF	9902224	99SWE017-86	MM1M	1.18
44	M. McLeod River	EXP	10/15-50-23-W5	21-May-99	RNTR	155	30	3	MgF	9902228	99SWE017-90	MM4M	1.23

Appendix I Selenium concentrations (µg/g wet weight) in fish tissues collected in west-central Alberta, 1999 (continued)

										MUSCLE			
REF NO.	Water Body	Site Type	Legal Description	Sample Date	Spp.	Fork Lgth. (mm)	Total Wght. (g)	Age (ann.)	Mat.	ARC_REF Number	AEP_REF Number	Smp LinkID	Se (µg/g)
45	M. McLeod River	EXP	10/15-50-23-W5	21-May-99	RNTR	155	**30****	3	ImM	9902226	99SWE017-88	MM2M	1.62
46	M. McLeod River	EXP	10/15-50-23-W5	21-May-99	RNTR	112	**10****	2	ImM	9902227	99SWE017-89	MM3M	1.54
47	U. McLeod River	EXP	47-21 to 48-22-W5	21-May-99	RNTR	187	70	4	GrF	9902216	99SWE017-78	UM6M	1.04
48	U. McLeod River	EXP	47-21 to 48-22-W5	21-May-99	RNTR	125	20	3	ImF	9902219	99SWE017-81	UM8M	0.714
49	U. McLeod River	EXP	47-21 to 48-22-W5	21-May-99	RNTR	168	40	4	MgF	9902220	99SWE017-82	UM9M	0.497
50	U. McLeod River	EXP	47-21 to 48-22-W5	21-May-99	RNTR	145	20	3	MgF	9902222	99SWE017-84	UM10M	0.993
51	U. McLeod River	EXP	47-21 to 48-22-W5	21-May-99	RNTR	160	**40****	3	RpM	9902213	99SWE017-75	UM3M	0.97
52	U. McLeod River	EXP	47-21 to 48-22-W5	21-May-99	RNTR	186	**60****	3	RpM	9902218	99SWE017-80	UM7M	0.97
53	U. McLeod River	EXP	47-21 to 48-22-W5	21-May-99	RNTR	122	**15****	2	ImF	9902211	99SWE017-73	UM1M	0.87
54	U. McLeod River	EXP	47-21 to 48-22-W5	21-May-99	RNTR	128	**10****	2	ImF	9902212	99SWE017-74	UM2M	1.10
55	U. McLeod River	EXP	47-21 to 48-22-W5	21-May-99	RNTR	122	**10****	2	ImF	9902214	99SWE017-76	UM4M	1.14
56	U. McLeod River	EXP	47-21 to 48-22-W5	21-May-99	RNTR	136	**20****	3	ImF	9902215	99SWE017-77	UM5M	1.12
57	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	176	47	5	RpF	9902257	99SWE018-19	WP1M	0.593
58	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	160	40	5	RpF	9902259	99SWE018-21	WP2M	0.749
59	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	166	43	5	RpF	9902261	99SWE018-23	WP3M	0.521
60	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	152	31	5	RpF	9902263	99SWE018-25	WP4M	0.623
61	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	160	34	5	RpF	9902265	99SWE018-27	WP5M	0.527
62	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	155	30	5	RpF	9902267	99SWE018-29	WP6M	0.620
63	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	163	36	6	RpF	9902269	99SWE018-31	WP7M	0.677
64	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	135	23	5	RpF	9902271	99SWE018-33	WP8M	1.11
65	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	165	35	5	RpF	9902273	99SWE018-35	WP9M	0.334
66	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	157	30	4	RpF	9902275	99SWE018-37	WP10M	0.580
67	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	137	21	5	RpF	9902277	99SWE018-39	WP11M	1.04
68	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	146	28	5	RpF	9902279	99SWE018-41	WP12M	1.04
69	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	169	41	5	RpF	9902281	99SWE018-43	WP13M	0.804
70	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	169	46	6	RpF	9902283	99SWE018-45	WP14M	0.550
71	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	140	26	5	RpF	9902285	99SWE018-47	WP15M	0.829
72	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	149	30	5	RpF	9902287	99SWE018-49	WP16M	0.608
73	Whitehorse Creek	REF	23-46-24-W5	19-May-99	RNTR	225	90	5	RpF	9902181	99SWE017-43	WH3M	0.917
74	Whitehorse Creek	REF	23-46-24-W5	19-May-99	RNTR	196	100	4	RpF	9902183	99SWE017-45	WH4M	0.864
75	Whitehorse Creek	REF	23-46-24-W5	19-May-99	RNTR	175	60	3	MgF	9902186	99SWE017-48	WH6M	1.00
76	Whitehorse Creek	REF	23-46-24-W5	19-May-99	RNTR	175	50	3	MgF	9902188	99SWE017-50	WH7M	1.07
77	Whitehorse Creek	REF	23-46-24-W5	19-May-99	RNTR	146	30	3	MgF	9902190	99SWE017-52	WH8M	1.24
78	Whitehorse Creek	REF	23-46-24-W5	19-May-99	RNTR	194	90	3	MtM	9902179	99SWE017-41	WH1M	0.960
79	Whitehorse Creek	REF	23-46-24-W5	19-May-99	RNTR	173	70	3	MtM	9902180	99SWE017-42	WH2M	1.13
80	Whitehorse Creek	REF	23-46-24-W5	19-May-99	RNTR	180	60	3	ImM	9902185	99SWE017-47	WH5M	1.23
81	Whitehorse Creek	REF	23-46-24-W5	19-May-99	RNTR	165	50	3	MgM	9902192	99SWE017-54	WH9M	0.910
82	Whitehorse Creek	REF	23-46-24-W5	19-May-99	RNTR	139	30	3	MtM	9902193	99SWE017-55	WH10M	1.13

Site Type: REF = reference; EXP = exposed
Spp: Species = RNTR (rainbow trout);
Age (ann.): ann. = number of annuli;
Mat.: Mat. = maturity: ImM - immature male; MgM - maturing male; MtM - mature male; GrM - green male; RpM - ripe male; SpM - spent male
ImF - immature female; MgF - maturing female; MtF - mature female; GrF - green female; RpF - ripe female; SpF - spent female;
ns: not sampled
** - the body weight of eight fish were reported incorrectly in Casey and Siwik (2000; ie, data in Table 4); the correct data are reported here.

Appendix I Selenium concentrations (µg/g wet weight) in fish tissues collected in west-central Alberta, 1999 (continued)

REF NO.	Water Body	Site Type	Legal Description	Sample Date	Spp.	Fork Lgth. (mm)	Total Wght. (g)	Age (ann.)	Mat.	MUSCLE ARC_REF Number	MUSCLE AEP_REF Number	MUSCLE Smp LinkID	MUSCLE Se (µg/g)
45	M. McLeod River	EXP	10/15-50-23-W5	21-May-99	RNTR	155	**30****	3	ImM	9902226	99SWE017-88	MM2M	1.62
46	M. McLeod River	EXP	10/15-50-23-W5	21-May-99	RNTR	112	**10****	2	ImM	9902227	99SWE017-89	MM3M	1.54
47	U. McLeod River	EXP	47-21 to 48-22-W5	21-May-99	RNTR	187	70	4	GrF	9902216	99SWE017-78	UM6M	1.04
48	U. McLeod River	EXP	47-21 to 48-22-W5	21-May-99	RNTR	125	20	3	ImF	9902219	99SWE017-81	UM8M	0.714
49	U. McLeod River	EXP	47-21 to 48-22-W5	21-May-99	RNTR	168	40	4	MgF	9902220	99SWE017-82	UM9M	0.497
50	U. McLeod River	EXP	47-21 to 48-22-W5	21-May-99	RNTR	145	20	3	MgF	9902222	99SWE017-84	UM10M	0.993
51	U. McLeod River	EXP	47-21 to 48-22-W5	21-May-99	RNTR	160	**40****	3	RpM	9902213	99SWE017-75	UM3M	0.97
52	U. McLeod River	EXP	47-21 to 48-22-W5	21-May-99	RNTR	186	**60****	3	RpM	9902218	99SWE017-80	UM7M	0.97
53	U. McLeod River	EXP	47-21 to 48-22-W5	21-May-99	RNTR	122	**15****	2	ImF	9902211	99SWE017-73	UM1M	0.87
54	U. McLeod River	EXP	47-21 to 48-22-W5	21-May-99	RNTR	128	**10****	2	ImF	9902212	99SWE017-74	UM2M	1.10
55	U. McLeod River	EXP	47-21 to 48-22-W5	21-May-99	RNTR	122	**10****	2	ImF	9902214	99SWE017-76	UM4M	1.14
56	U. McLeod River	EXP	47-21 to 48-22-W5	21-May-99	RNTR	136	**20****	3	ImF	9902215	99SWE017-77	UM5M	1.12
57	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	176	47	5	RpF	9902257	99SWE018-19	WP1M	0.593
58	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	160	40	5	RpF	9902259	99SWE018-21	WP2M	0.749
59	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	166	43	5	RpF	9902261	99SWE018-23	WP3M	0.521
60	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	152	31	5	RpF	9902263	99SWE018-25	WP4M	0.623
61	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	160	34	5	RpF	9902265	99SWE018-27	WP5M	0.527
62	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	155	30	5	RpF	9902267	99SWE018-29	WP6M	0.620
63	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	163	36	6	RpF	9902269	99SWE018-31	WP7M	0.677
64	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	135	23	5	RpF	9902271	99SWE018-33	WP8M	1.11
65	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	165	35	5	RpF	9902273	99SWE018-35	WP9M	0.334
66	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	157	30	4	RpF	9902275	99SWE018-37	WP10M	0.580
67	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	137	21	5	RpF	9902277	99SWE018-39	WP11M	1.04
68	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	146	28	5	RpF	9902279	99SWE018-41	WP12M	1.04
69	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	169	41	5	RpF	9902281	99SWE018-43	WP13M	0.804
70	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	169	46	6	RpF	9902283	99SWE018-45	WP14M	0.550
71	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	140	26	5	RpF	9902285	99SWE018-47	WP15M	0.829
72	Wampus Creek	REF	10-48-23-W5	29-May-99	RNTR	149	30	5	RpF	9902287	99SWE018-49	WP16M	0.608
73	Whitehorse Creek	REF	23-46-24-W5	19-May-99	RNTR	225	90	5	RpF	9902181	99SWE017-43	WH3M	0.917
74	Whitehorse Creek	REF	23-46-24-W5	19-May-99	RNTR	196	100	4	RpF	9902183	99SWE017-45	WH4M	0.864
75	Whitehorse Creek	REF	23-46-24-W5	19-May-99	RNTR	175	60	3	MgF	9902186	99SWE017-48	WH6M	1.00
76	Whitehorse Creek	REF	23-46-24-W5	19-May-99	RNTR	175	50	3	MgF	9902188	99SWE017-50	WH7M	1.07
77	Whitehorse Creek	REF	23-46-24-W5	19-May-99	RNTR	146	30	3	MgF	9902190	99SWE017-52	WH8M	1.24
78	Whitehorse Creek	REF	23-46-24-W5	19-May-99	RNTR	194	90	3	MtM	9902179	99SWE017-41	WH1M	0.960
79	Whitehorse Creek	REF	23-46-24-W5	19-May-99	RNTR	173	70	3	MtM	9902180	99SWE017-42	WH2M	1.13
80	Whitehorse Creek	REF	23-46-24-W5	19-May-99	RNTR	180	60	3	ImM	9902185	99SWE017-47	WH5M	1.23
81	Whitehorse Creek	REF	23-46-24-W5	19-May-99	RNTR	165	50	3	MgM	9902192	99SWE017-54	WH9M	0.910
82	Whitehorse Creek	REF	23-46-24-W5	19-May-99	RNTR	139	30	3	MtM	9902193	99SWE017-55	WH10M	1.13

Site Type: REF = reference; EXP = exposed
Spp: Species = RNTR (rainbow trout);
Age (ann.): ann. = number of annuli;
Mat.: Mat. = maturity: ImM - immature male; MgM - maturing male; MtM - mature male; GrM - green male; RpM - ripe male; SpM - spent male
ImF - immature female; MgF - maturing female; MtF - mature female; GrF - green female; RpF - ripe female; SpF - spent female;
ns: not sampled
** - the body weight of eight fish were reported incorrectly in Casey and Siwik (2000; ie, data in Table 4); the correct data are reported here.

Appendix I Selenium concentrations (µg/g wet weight) in fish tissues collected in west-central Alberta, 1999 (continued)

					GONAD			
REF NO.	Water Body	Site Type	Sample Date	Spp.	ARC_REF Number	AEP_REF Number	Smp LinkID	Se (µg/g)
1	Fairfax Lake	REF	18-May-99	RNTR	9902252	99SWE018-14	FX1E	0.435
2	Fairfax Lake	REF	18-May-99	RNTR	9902254	99SWE018-16	FX2E	0.362
3	Fairfax Lake	REF	18-May-99	RNTR	9902256	99SWE018-18	FX3E	0.499
4	Gregg River	EXP	20-May-99	RNTR	9902232	99SWE017-94	GR1E	4.08
5	Gregg River	EXP	20-May-99	RNTR	9902234	99SWE017-96	GR2E	9.83
6	Gregg River	EXP	20-May-99	RNTR	9902236	99SWE017-98	GR3E	7.23
7	Gregg River	EXP	20-May-99	RNTR	9902238	99SWE018-00	GR4E	9.28
8	Gregg River	EXP	20-May-99	RNTR	9902240	99SWE018-02	GR5E	2.17
9	Gregg River	EXP	20-May-99	RNTR	9902242	99SWE018-04	GR6E	12.1
10	Gregg River	EXP	20-May-99	RNTR	9902244	99SWE018-06	GR7E	10.8
11	Gregg River	EXP	20-May-99	RNTR	9902246	99SWE018-08	GR8E	8.95
12	Gregg River	EXP	20-May-99	RNTR	9902248	99SWE018-10	GR9E	9.96
13	Gregg River	EXP	20-May-99	RNTR	9902250	99SWE018-12	GR10E	9.21
14	Lac Des Roches	EXP	26-May-99	RNTR	9902298	99SWE018-60	358E	21.5
15	Lac Des Roches	EXP	26-May-99	RNTR	9902300	99SWE018-62	369E	21.4
16	Lac Des Roches	EXP	28-May-99	RNTR	9902302	99SWE018-64	370E	27.3
17	Lac Des Roches	EXP	26-May-99	RNTR	9902304	99SWE018-66	374E	23.4
18	Lac Des Roches	EXP	26-May-99	RNTR	9902306	99SWE018-68	380E	20.8
19	Lac Des Roches	EXP	26-May-99	RNTR	9902308	99SWE018-70	383E	21.7
20	Lac Des Roches	EXP	26-May-99	RNTR	9902310	99SWE018-72	411E	22.1
21	Lac Des Roches	EXP	26-May-99	RNTR	9902312	99SWE018-74	424E	24.7
22	Lac Des Roches	EXP	26-May-99	RNTR	9902314	99SWE018-76	451E	17.8
23	Lac Des Roches	EXP	26-May-99	RNTR	9902316	99SWE018-78	452E	21.6
24	Lac Des Roches	EXP	26-May-99	RNTR	9902318	99SWE018-80	454E	25.8
25	Lac Des Roches	EXP	26-May-99	RNTR	9902320	99SWE018-82	457E	22.7
26	Lac Des Roches	EXP	26-May-99	RNTR	9902322	99SWE018-84	461E	18.6
27	Lac Des Roches	EXP	26-May-99	RNTR	9902324	99SWE018-86	463E	26.4
28	Lac Des Roches	EXP	26-May-99	RNTR	9902326	99SWE018-88	464E	16.6
29	Lac Des Roches	EXP	28-May-99	RNTR	9902328	99SWE018-90	468E	22.2
30	Lac Des Roches	EXP	28-May-99	RNTR	9902330	99SWE018-92	470E	22.6
31	Lac Des Roches	EXP	28-May-99	RNTR	9902332	99SWE018-94	471E	21.0
32	Lac Des Roches	EXP	28-May-99	RNTR	9902334	99SWE018-96	472E	18.7
33	Luscar Creek	EXP	17-May-99	RNTR	9902195	99SWE017-57	LC1E	19.9
34	Luscar Creek	EXP	17-May-99	RNTR	9902197	99SWE017-59	LC2E	16.2
35	Luscar Creek	EXP	17-May-99	RNTR	9902199	99SWE017-61	LC3E	16.5
36	Luscar Creek	EXP	26-May-99	RNTR	9902201	99SWE017-63	LC4E	17.6
37	Luscar Creek	EXP	26-May-99	RNTR	9902205	99SWE017-67	LC7E	16.5
38	Luscar Creek	EXP	26-May-99	RNTR	9902207	99SWE017-69	LC8E	20.9
39	Luscar Creek	EXP	26-May-99	RNTR	9902209	99SWE017-71	LC9E	28.9
40	Luscar Creek	EXP	26-May-99	RNTR			ns	
41	Luscar Creek	EXP	26-May-99	RNTR			ns	
42	Luscar Creek	EXP	26-May-99	RNTR			ns	
43	M. McLeod River	EXP	21-May-99	RNTR	9902225	99SWE017-87	MM1E	18.7
44	M. McLeod River	EXP	21-May-99	RNTR	9902229	99SWE017-91	MM4E	14.0

Appendix I Selenium concentrations (µg/g wet weight) in fish tissues collected in west-central Alberta, 1999 (continued)

					GONAD			
REF NO.	Water Body	Site Type	Sample Date	Spp.	ARC_REF Number	AEP_REF Number	Smp LinkID	Se (µg/g)
45	M. McLeod River	EXP	21-May-99	RNTR			ns	
46	M. McLeod River	EXP	21-May-99	RNTR			ns	
47	U. McLeod River	EXP	21-May-99	RNTR	9902217	99SWE017-79	UM6E	5.55
48	U. McLeod River	EXP	21-May-99	RNTR			ns	
49	U. McLeod River	EXP	21-May-99	RNTR	9902221	99SWE017-83	UM9E	5.97
50	U. McLeod River	EXP	21-May-99	RNTR	9902223	99SWE017-85	UM10E	5.79
51	U. McLeod River	EXP	21-May-99	RNTR			ns	
52	U. McLeod River	EXP	21-May-99	RNTR			ns	
53	U. McLeod River	EXP	21-May-99	RNTR			ns	
54	U. McLeod River	EXP	21-May-99	RNTR			ns	
55	U. McLeod River	EXP	21-May-99	RNTR			ns	
56	U. McLeod River	EXP	21-May-99	RNTR			ns	
57	Wampus Creek	REF	29-May-99	RNTR	9902258	99SWE018-20	WP1E	0.021
58	Wampus Creek	REF	29-May-99	RNTR	9902260	99SWE018-22	WP2E	1.88
59	Wampus Creek	REF	29-May-99	RNTR	9902262	99SWE018-24	WP3E	1.37
60	Wampus Creek	REF	29-May-99	RNTR	9902264	99SWE018-26	WP4E	2.03
61	Wampus Creek	REF	29-May-99	RNTR	9902266	99SWE018-28	WP5E	1.43
62	Wampus Creek	REF	29-May-99	RNTR	9902268	99SWE018-30	WP6E	2.45
63	Wampus Creek	REF	29-May-99	RNTR	9902270	99SWE018-32	WP7E	1.97
64	Wampus Creek	REF	29-May-99	RNTR	9902272	99SWE018-34	WP8E	2.60
65	Wampus Creek	REF	29-May-99	RNTR	9902274	99SWE018-36	WP9E	1.36
66	Wampus Creek	REF	29-May-99	RNTR	9902276	99SWE018-38	WP10E	2.64
67	Wampus Creek	REF	29-May-99	RNTR	9902278	99SWE018-40	WP11E	2.65
68	Wampus Creek	REF	29-May-99	RNTR	9902280	99SWE018-42	WP12E	2.46
69	Wampus Creek	REF	29-May-99	RNTR	9902282	99SWE018-44	WP13E	2.10
70	Wampus Creek	REF	29-May-99	RNTR	9902284	99SWE018-46	WP14E	4.01
71	Wampus Creek	REF	29-May-99	RNTR	9902286	99SWE018-48	WP15E	2.89
72	Wampus Creek	REF	29-May-99	RNTR	9902288	99SWE018-50	WP16E	1.56
73	Whitehorse Creek	REF	19-May-99	RNTR	9902182	99SWE017-44	WH3E	4.45
74	Whitehorse Creek	REF	19-May-99	RNTR	9902184	99SWE017-46	WH4E	3.86
75	Whitehorse Creek	REF	19-May-99	RNTR	9902187	99SWE017-49	WH6E	11.4
76	Whitehorse Creek	REF	19-May-99	RNTR	9902189	99SWE017-51	WH7E	14.6
77	Whitehorse Creek	REF	19-May-99	RNTR	9902191	99SWE017-53	WH8E	21.2
78	Whitehorse Creek	REF	19-May-99	RNTR			ns	
79	Whitehorse Creek	REF	19-May-99	RNTR			ns	
80	Whitehorse Creek	REF	19-May-99	RNTR			ns	
81	Whitehorse Creek	REF	19-May-99	RNTR			ns	
82	Whitehorse Creek	REF	19-May-99	RNTR			ns	

Appendix II Selenium concentrations (µg/g wet weight) in fish tissues collected in west-central Alberta, 2000

											MUSCLE		LIVER		GONAD		WHOLE FISH	
REF NO.	Water Body	Site Type	Legal Description	Sample Date	Spp.	Fork Lgth. (mm)	Total Wght. (g)	Age (ann.)	Mat.	Client ID	ARC_ REF Number	Se (µg/g)	ARC_REF Number	Se (µg/g)	ARC_ REF Number	Se (µg/g)	ARC_ REF Number	Se (µg/g)
1	Beaverdam Creek	EXP	20-59-9-W6	24-Oct-00	BLTR	151	31	2	Im?	BLTR-01	0002720	0.479	0003026	3.446				
2	Beaverdam Creek	EXP	20-59-9-W6	24-Oct-00	BLTR	142	27	2	Im?	BLTR-02	0002721	0.705	0003027	4.283				
3	Beaverdam Creek	EXP	20-59-9-W6	24-Oct-00	BLTR	149	38	2	Im?	BLTR-03	0002722	0.765	0003028	3.930				
4	Beaverdam Creek	EXP	20-59-9-W6	24-Oct-00	BLTR	101	10	ns	Im?	BLTR-04	0002723	0.639	0003029	2.799				
5	Beaverdam Creek	EXP	20-59-9-W6	24-Oct-00	BLTR	133	22	2	Im?	BLTR-05	0002724	0.540	0003030	3.078				
6	Beaverdam Creek	EXP	20-59-9-W6	24-Oct-00	BLTR	130	20	2	Im?	BLTR-06	0002725	0.504	0003031	2.910				
7	Beaverdam Creek	EXP	20-59-9-W6	24-Oct-00	BLTR	128	23	ns	Im?	BLTR-07	0002726	0.466	0003032	2.239				
8	Beaverdam Creek	EXP	20-59-9-W6	24-Oct-00	BLTR	167	51	2	Im?	BLTR-08	0002727	0.797	0003033	3.749				
9	Beaverdam Creek	EXP	20-59-9-W6	24-Oct-00	BLTR	125	19	ns	Im?	BLTR-09	0002728	0.460	0003034	2.298				
10	Beaverdam Creek	EXP	20-59-9-W6	24-Oct-00	BLTR	130	20	2	Im?	BLTR-10	0002729	0.508	0003035	3.549				
11	Beaverdam Creek	EXP	20-59-9-W6	24-Oct-00	BLTR	85	8	1	Im?	BLTR-11	0002730	1.030	0003036	3.291				
12	Beaverdam Creek	EXP	20-59-9-W6	24-Oct-00	BLTR	137	24	ns	Im?	BLTR-12	0002731	0.500	0003037	2.905				
13	Cheviot Creek	EXP	4-46-23-W5	5-Oct-00	BKTR	223	155	5	MtM	BKTR-01	0002732	1.430	0003038	5.104				
14	Cheviot Creek	EXP	4-46-23-W5	5-Oct-00	BKTR	214	140	4	MtM	BKTR-02	0002733	0.893	0003039	3.767				
15	Cheviot Creek	EXP	4-46-23-W5	5-Oct-00	BKTR	233	145	4	MtM	BKTR-03	0002734	0.866	0003040	3.244				
16	Cheviot Creek	EXP	4-46-23-W5	5-Oct-00	BKTR	256	234	5	MtF	BKTR-04	0002735	0.775	0003041	1.345	0002935	5.354		
17	Cheviot Creek	EXP	4-46-23-W5	5-Oct-00	BKTR	166	57	2	MtM	BKTR-05	0002736	1.119	0003042	3.131				
18	Cheviot Creek	EXP	4-46-23-W5	5-Oct-00	BKTR	143	35	2	ImF	BKTR-06	0002737	1.040	0003043	3.486	0002936	2.736		
19	Cheviot Creek	EXP	4-46-23-W5	5-Oct-00	BKTR	148	37	2	ImF	BKTR-07	0002738	1.077	0003044	3.481	0002937	2.177		
20	Cheviot Creek	EXP	4-46-23-W5	5-Oct-00	BKTR	145	36	2	Im?	BKTR-08	0002739	1.160	0003045	3.404				
21	Cheviot Creek	EXP	4-46-23-W5	5-Oct-00	BKTR	102	15	1	Im?	BKTR-09	0002740	1.027	0003046	3.484				
22	Cheviot Creek	EXP	4-46-23-W5	5-Oct-00	BKTR	96	11	1	Im?	BKTR-10	0002741	0.868	0003047	3.423				
23	Cheviot Creek	EXP	4-46-23-W5	5-Oct-00	BKTR	81	7	1	Im?	BKTR-11	0002742	1.185	0003048	3.630				
24	Cheviot Creek	EXP	4-46-23-W5	5-Oct-00	BKTR	260	274	7	MtM	BKTR-12	0002743	0.488	0003049	2.982				
25	Cold Creek	REF	28-50-25-W5	13-Oct-00	BKTR	268	187	3	MtF	BKTR-01	0100257	0.481		ns				
26	Cold Creek	REF	28-50-25-W5	13-Oct-00	BKTR	158	48	2	MtF	BKTR-02	0100258	0.434		ns				
27	Cold Creek	REF	28-50-25-W5	13-Oct-00	BKTR	192	81	3	MtM	BKTR-03	0100259	0.520		ns				
28	Cold Creek	REF	28-50-25-W5	13-Oct-00	BKTR	191	79	3	MtF	BKTR-04	0100260	0.311		ns				
29	Cold Creek	REF	28-50-25-W5	13-Oct-00	BKTR	189	62	3	MtF	BKTR-05	0100261	0.391		ns				
30	Cold Creek	REF	28-50-25-W5	13-Oct-00	BKTR	219	121	2	MtM	BKTR-06	0100262	0.608		ns				
31	Cold Creek	REF	28-50-25-W5	13-Oct-00	BKTR	159	44	7	MtM	BKTR-07	0100263	0.632		ns				
32	Cold Creek	REF	28-50-25-W5	13-Oct-00	BKTR	162	49	2	MtM	BKTR-08	0100264	0.631		ns				
33	Cold Creek	REF	28-50-25-W5	13-Oct-00	BKTR	182	71	ns	MtM	BKTR-09	0100265	0.528		ns				
34	Cold Creek	REF	28-50-25-W5	13-Oct-00	BKTR	165	52	2	MtM	BKTR-10	0100266	0.718		ns				
35	Cold Creek	REF	28-50-25-W5	13-Oct-00	BKTR	163	48	2	MtM	BKTR-11	0100267	0.323		ns				
36	Cold Creek	REF	28-50-25-W5	13-Oct-00	BKTR	269	196	ns	MtF	BKTR-12	0100268	0.663		ns				
37	Cold Creek	REF	28-50-25-W5	13-Oct-00	BKTR	214	99	3	MtF	BKTR-13	0100269	0.484		ns				
38	Cold Creek	REF	28-50-25-W5	13-Oct-00	BKTR	248	151	ns	MtF	BKTR-14	0100270	1.111		ns				
39	Deerlick Creek	REF	14-48-23-W5	7-Jun-00	RNTR	138	22	ns	ImM	DC-RT1	0001560	0.225		ns				

Appendix II Selenium concentrations (µg/g wet weight) in fish tissues collected in west-central Alberta, 2000

											MUSCLE		LIVER		GONAD		WHOLE FISH	
REF NO.	Water Body	Site Type	Legal Description	Sample Date	Spp.	Fork Lgth. (mm)	Total Wght. (g)	Age (ann.)	Mat.	Client ID	ARC_ REF Number	Se (µg/g)	ARC_REF Number	Se (µg/g)	ARC_ REF Number	Se (µg/g)	ARC_ REF Number	Se (µg/g)
1	Beaverdam Creek	EXP	20-59-9-W6	24-Oct-00	BLTR	151	31	2	Im?	BLTR-01	0002720	0.479	0003026	3.446				
2	Beaverdam Creek	EXP	20-59-9-W6	24-Oct-00	BLTR	142	27	2	Im?	BLTR-02	0002721	0.705	0003027	4.283				
3	Beaverdam Creek	EXP	20-59-9-W6	24-Oct-00	BLTR	149	38	2	Im?	BLTR-03	0002722	0.765	0003028	3.930				
4	Beaverdam Creek	EXP	20-59-9-W6	24-Oct-00	BLTR	101	10	ns	Im?	BLTR-04	0002723	0.639	0003029	2.799				
5	Beaverdam Creek	EXP	20-59-9-W6	24-Oct-00	BLTR	133	22	2	Im?	BLTR-05	0002724	0.540	0003030	3.078				
6	Beaverdam Creek	EXP	20-59-9-W6	24-Oct-00	BLTR	130	20	2	Im?	BLTR-06	0002725	0.504	0003031	2.910				
7	Beaverdam Creek	EXP	20-59-9-W6	24-Oct-00	BLTR	128	23	ns	Im?	BLTR-07	0002726	0.466	0003032	2.239				
8	Beaverdam Creek	EXP	20-59-9-W6	24-Oct-00	BLTR	167	51	2	Im?	BLTR-08	0002727	0.797	0003033	3.749				
9	Beaverdam Creek	EXP	20-59-9-W6	24-Oct-00	BLTR	125	19	ns	Im?	BLTR-09	0002728	0.460	0003034	2.298				
10	Beaverdam Creek	EXP	20-59-9-W6	24-Oct-00	BLTR	130	20	2	Im?	BLTR-10	0002729	0.508	0003035	3.549				
11	Beaverdam Creek	EXP	20-59-9-W6	24-Oct-00	BLTR	85	8	1	Im?	BLTR-11	0002730	1.030	0003036	3.291				
12	Beaverdam Creek	EXP	20-59-9-W6	24-Oct-00	BLTR	137	24	ns	Im?	BLTR-12	0002731	0.500	0003037	2.905				
13	Cheviot Creek	EXP	4-46-23-W5	5-Oct-00	BKTR	223	155	5	MtM	BKTR-01	0002732	1.430	0003038	5.104				
14	Cheviot Creek	EXP	4-46-23-W5	5-Oct-00	BKTR	214	140	4	MtM	BKTR-02	0002733	0.893	0003039	3.767				
15	Cheviot Creek	EXP	4-46-23-W5	5-Oct-00	BKTR	233	145	4	MtM	BKTR-03	0002734	0.866	0003040	3.244				
16	Cheviot Creek	EXP	4-46-23-W5	5-Oct-00	BKTR	256	234	5	MtF	BKTR-04	0002735	0.775	0003041	1.345	0002935	5.354		
17	Cheviot Creek	EXP	4-46-23-W5	5-Oct-00	BKTR	166	57	2	MtM	BKTR-05	0002736	1.119	0003042	3.131				
18	Cheviot Creek	EXP	4-46-23-W5	5-Oct-00	BKTR	143	35	2	ImF	BKTR-06	0002737	1.040	0003043	3.486	0002936	2.736		
19	Cheviot Creek	EXP	4-46-23-W5	5-Oct-00	BKTR	148	37	2	ImF	BKTR-07	0002738	1.077	0003044	3.481	0002937	2.177		
20	Cheviot Creek	EXP	4-46-23-W5	5-Oct-00	BKTR	145	36	2	Im?	BKTR-08	0002739	1.160	0003045	3.404				
21	Cheviot Creek	EXP	4-46-23-W5	5-Oct-00	BKTR	102	15	1	Im?	BKTR-09	0002740	1.027	0003046	3.484				
22	Cheviot Creek	EXP	4-46-23-W5	5-Oct-00	BKTR	96	11	1	Im?	BKTR-10	0002741	0.868	0003047	3.423				
23	Cheviot Creek	EXP	4-46-23-W5	5-Oct-00	BKTR	81	7	1	Im?	BKTR-11	0002742	1.185	0003048	3.630				
24	Cheviot Creek	EXP	4-46-23-W5	5-Oct-00	BKTR	260	274	7	MtM	BKTR-12	0002743	0.488	0003049	2.982				
25	Cold Creek	REF	28-50-25-W5	13-Oct-00	BKTR	268	187	3	MtF	BKTR-01	0100257	0.481		ns				
26	Cold Creek	REF	28-50-25-W5	13-Oct-00	BKTR	158	48	2	MtF	BKTR-02	0100258	0.434		ns				
27	Cold Creek	REF	28-50-25-W5	13-Oct-00	BKTR	192	81	3	MtM	BKTR-03	0100259	0.520		ns				
28	Cold Creek	REF	28-50-25-W5	13-Oct-00	BKTR	191	79	3	MtF	BKTR-04	0100260	0.311		ns				
29	Cold Creek	REF	28-50-25-W5	13-Oct-00	BKTR	189	62	3	MtF	BKTR-05	0100261	0.391		ns				
30	Cold Creek	REF	28-50-25-W5	13-Oct-00	BKTR	219	121	2	MtM	BKTR-06	0100262	0.608		ns				
31	Cold Creek	REF	28-50-25-W5	13-Oct-00	BKTR	159	44	7	MtM	BKTR-07	0100263	0.632		ns				
32	Cold Creek	REF	28-50-25-W5	13-Oct-00	BKTR	162	49	2	MtM	BKTR-08	0100264	0.631		ns				
33	Cold Creek	REF	28-50-25-W5	13-Oct-00	BKTR	182	71	ns	MtM	BKTR-09	0100265	0.528		ns				
34	Cold Creek	REF	28-50-25-W5	13-Oct-00	BKTR	165	52	2	MtM	BKTR-10	0100266	0.718		ns				
35	Cold Creek	REF	28-50-25-W5	13-Oct-00	BKTR	163	48	2	MtM	BKTR-11	0100267	0.323		ns				
36	Cold Creek	REF	28-50-25-W5	13-Oct-00	BKTR	269	196	ns	MtF	BKTR-12	0100268	0.663		ns				
37	Cold Creek	REF	28-50-25-W5	13-Oct-00	BKTR	214	99	3	MtF	BKTR-13	0100269	0.484		ns				
38	Cold Creek	REF	28-50-25-W5	13-Oct-00	BKTR	248	151	ns	MtF	BKTR-14	0100270	1.111		ns				
39	Deerlick Creek	REF	14-48-23-W5	7-Jun-00	RNTR	138	22	ns	ImM	DC-RT1	0001560	0.225		ns				

Appendix II Selenium concentrations (µg/g wet weight) in fish tissues collected in west-central Alberta, 2000 (continued)

											MUSCLE		LIVER		GONAD		WHOLE FISH	
REF NO.	Water Body	Site Type	Legal Description	Sample Date	Spp.	Fork Lgth. (mm)	Total Wght. (g)	Age (ann.)	Mat.	Client ID	ARC_ REF Number	Se (µg/g)	ARC_REF Number	Se (µg/g)	ARC_ REF Number	Se (µg/g)	ARC_ REF Number	Se (µg/g)
40	Deerlick Creek	REF	14-48-23-W5	7-Jun-00	RNTR	135	28	ns	MtM	DC-RT10	0001564	0.315		ns				
41	Deerlick Creek	REF	14-48-23-W5	7-Jun-00	RNTR	135	25	ns	MtM	DC-RT11	0001565	0.221		ns				
42	Deerlick Creek	REF	14-48-23-W5	7-Jun-00	RNTR	122	18	ns	MtF	DC-RT12	0001566	0.274		ns				
43	Deerlick Creek	REF	14-48-23-W5	7-Jun-00	RNTR	138	22	ns	MtM	DC-RT13	0001568	0.307		ns				
44	Deerlick Creek	REF	14-48-23-W5	7-Jun-00	RNTR	111	12	ns	MtM	DC-RT14	0001569	0.401		ns				
45	Deerlick Creek	REF	14-48-23-W5	8-Jun-00	RNTR	210	91	ns	MtF	DC-RT15	0001570	0.909		ns				
46	Deerlick Creek	REF	14-48-23-W5	8-Jun-00	RNTR	186	71	ns	MtF	DC-RT16	0001572	0.266		ns				
47	Deerlick Creek	REF	14-48-23-W5	8-Jun-00	RNTR	185	57	ns	MtF	DC-RT17	0001574	0.348		ns				
48	Deerlick Creek	REF	14-48-23-W5	8-Jun-00	RNTR	187	62	ns	MtF	DC-RT18	0001576	0.380		ns				
49	Deerlick Creek	REF	14-48-23-W5	8-Jun-00	RNTR	178	60	ns	MtM	DC-RT19	0001578	0.266		ns				
50	Deerlick Creek	REF	14-48-23-W5	8-Jun-00	RNTR	170	45	ns	MtM	DC-RT20	0001579	0.655		ns				
51	Deerlick Creek	REF	14-48-23-W5	8-Jun-00	RNTR	171	53	ns	MtM	DC-RT21	0001580	0.396		ns				
52	Deerlick Creek	REF	14-48-23-W5	8-Jun-00	RNTR	223	121	ns	MtM	DC-RT22	0001581	0.811		ns				
53	Deerlick Creek	REF	14-48-23-W5	9-Jun-00	RNTR	185	64	ns	MtM	DC-RT23	0001582	0.580		ns				
54	Deerlick Creek	REF	14-48-23-W5	7-Jun-00	RNTR	128	18	ns	MtF	DC-RT8	0001561	0.316		ns				
55	Deerlick Creek	REF	14-48-23-W5	7-Jun-00	RNTR	112	14	ns	MtM	DC-RT9	0001563	0.289		ns				
56	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	BKTR	243	208	2	MtF	BKTR-01	0100157	0.209	0100214	0.557	0100185	0.497		
57	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	BKTR	245	185	2	MtM	BKTR-02	0100158	0.050	0100215	3.507				
58	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	BKTR	453	1633	7	MtM	BKTR-03	0100159	0.171	0100216	0.566				
59	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	BKTR	262	199	2	MtF	BKTR-04	0100160	0.050	0100217	0.226	0100186	0.628		
60	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	BKTR	204	116	1	MtF	BKTR-05	0100161	0.245	0100218	0.160	0100187	0.837		
61	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	BKTR	229	183	1	MtM	BKTR-06	0100162	0.328	0100219	0.741				
62	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	BKTR	229	201	2	MtF	BKTR-07	0100163	0.254	0100220	1.158	0100188	0.692		
63	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	BKTR	200	116	1	MtF	BKTR-08	0100164	0.208	0100221	4.899	0100189	0.770		
64	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	RNTR	278	231	3	Im?	RNTR-01	0100144	0.050	0100202	3.568				
65	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	RNTR	279	275	3	MtM	RNTR-02	0100145	0.151	0100203	2.289				
66	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	RNTR	261	232	3	Im?	RNTR-03	0100146	0.050	0100204	1.598				
67	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	RNTR	263	203	2	Im?	RNTR-04	0100147	0.050	0100205	0.626				
68	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	RNTR	266	236	2	Im?	RNTR-05	0100148	0.050	0100206	2.325				
69	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	RNTR	192	94	2	Im?	RNTR-06	0100149	0.323	0100207	2.007				
70	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	RNTR	205	99	1	Im?	RNTR-07	0100150	0.298	0100208	1.643				
71	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	RNTR	233	158	1	MtF	RNTR-08	0100151	0.237	0100209	1.331	0100183	0.632		
72	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	RNTR	192	90	0	MtF	RNTR-09	0100152	0.050	0100210	6.000				
73	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	RNTR	203	101	0	MtF	RNTR-10	0100153	0.156	0100211	5.050	0100184	0.417		
74	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	RNTR	198	101	0	Im?	RNTR-11	0100154	0.156	0100212	4.642				
75	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	RNTR	203	101	0	Im?	RNTR-12	0100155	0.282	0100213	3.489				
76	Gregg River	EXP	8-49-24-W5	4-Oct-00	BKTR	204	115	3	MtM	BKTR-01	0002745	2.250	0003050	5.609				
77	Gregg River	EXP	8-49-24-W5	4-Oct-00	BKTR	216	132	3	MtF	BKTR-02	0002746	0.763	0003051	1.405	0002939	5.351		
78	Gregg River	EXP	8-49-24-W5	4-Oct-00	BKTR	202	101	3	MtF	BKTR-03	0002747	1.450	0003052	2.990	0002940	5.256		
79	Gregg River	EXP	8-49-24-W5	4-Oct-00	BKTR	180	64	4	MtF	BKTR-04	0002748	2.042	0003053	4.525	0002941	3.470		
80	Gregg River	EXP	8-49-24-W5	4-Oct-00	BKTR	151	49	2	MtM	BKTR-05	0002749	1.247	0003054	5.469				

Appendix II Selenium concentrations (µg/g wet weight) in fish tissues collected in west-central Alberta, 2000 (continued)

											MUSCLE		LIVER		GONAD		WHOLE FISH	
REF NO.	Water Body	Site Type	Legal Description	Sample Date	Spp.	Fork Lgth. (mm)	Total Wght. (g)	Age (ann.)	Mat.	Client ID	ARC_ REF Number	Se (µg/g)	ARC_REF Number	Se (µg/g)	ARC_ REF Number	Se (µg/g)	ARC_ REF Number	Se (µg/g)
40	Deerlick Creek	REF	14-48-23-W5	7-Jun-00	RNTR	135	28	ns	MtM	DC-RT10	0001564	0.315		ns				
41	Deerlick Creek	REF	14-48-23-W5	7-Jun-00	RNTR	135	25	ns	MtM	DC-RT11	0001565	0.221		ns				
42	Deerlick Creek	REF	14-48-23-W5	7-Jun-00	RNTR	122	18	ns	MtF	DC-RT12	0001566	0.274		ns				
43	Deerlick Creek	REF	14-48-23-W5	7-Jun-00	RNTR	138	22	ns	MtM	DC-RT13	0001568	0.307		ns				
44	Deerlick Creek	REF	14-48-23-W5	7-Jun-00	RNTR	111	12	ns	MtM	DC-RT14	0001569	0.401		ns				
45	Deerlick Creek	REF	14-48-23-W5	8-Jun-00	RNTR	210	91	ns	MtF	DC-RT15	0001570	0.909		ns				
46	Deerlick Creek	REF	14-48-23-W5	8-Jun-00	RNTR	186	71	ns	MtF	DC-RT16	0001572	0.266		ns				
47	Deerlick Creek	REF	14-48-23-W5	8-Jun-00	RNTR	185	57	ns	MtF	DC-RT17	0001574	0.348		ns				
48	Deerlick Creek	REF	14-48-23-W5	8-Jun-00	RNTR	187	62	ns	MtF	DC-RT18	0001576	0.380		ns				
49	Deerlick Creek	REF	14-48-23-W5	8-Jun-00	RNTR	178	60	ns	MtM	DC-RT19	0001578	0.266		ns				
50	Deerlick Creek	REF	14-48-23-W5	8-Jun-00	RNTR	170	45	ns	MtM	DC-RT20	0001579	0.655		ns				
51	Deerlick Creek	REF	14-48-23-W5	8-Jun-00	RNTR	171	53	ns	MtM	DC-RT21	0001580	0.396		ns				
52	Deerlick Creek	REF	14-48-23-W5	8-Jun-00	RNTR	223	121	ns	MtM	DC-RT22	0001581	0.811		ns				
53	Deerlick Creek	REF	14-48-23-W5	9-Jun-00	RNTR	185	64	ns	MtM	DC-RT23	0001582	0.580		ns				
54	Deerlick Creek	REF	14-48-23-W5	7-Jun-00	RNTR	128	18	ns	MtF	DC-RT8	0001561	0.316		ns				
55	Deerlick Creek	REF	14-48-23-W5	7-Jun-00	RNTR	112	14	ns	MtM	DC-RT9	0001563	0.289		ns				
56	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	BKTR	243	208	2	MtF	BKTR-01	0100157	0.209	0100214	0.557	0100185	0.497		
57	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	BKTR	245	185	2	MtM	BKTR-02	0100158	0.050	0100215	3.507				
58	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	BKTR	453	1633	7	MtM	BKTR-03	0100159	0.171	0100216	0.566				
59	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	BKTR	262	199	2	MtF	BKTR-04	0100160	0.050	0100217	0.226	0100186	0.628		
60	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	BKTR	204	116	1	MtF	BKTR-05	0100161	0.245	0100218	0.160	0100187	0.837		
61	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	BKTR	229	183	1	MtM	BKTR-06	0100162	0.328	0100219	0.741				
62	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	BKTR	229	201	2	MtF	BKTR-07	0100163	0.254	0100220	1.158	0100188	0.692		
63	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	BKTR	200	116	1	MtF	BKTR-08	0100164	0.208	0100221	4.899	0100189	0.770		
64	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	RNTR	278	231	3	Im?	RNTR-01	0100144	0.050	0100202	3.568				
65	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	RNTR	279	275	3	MtM	RNTR-02	0100145	0.151	0100203	2.289				
66	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	RNTR	261	232	3	Im?	RNTR-03	0100146	0.050	0100204	1.598				
67	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	RNTR	263	203	2	Im?	RNTR-04	0100147	0.050	0100205	0.626				
68	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	RNTR	266	236	2	Im?	RNTR-05	0100148	0.050	0100206	2.325				
69	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	RNTR	192	94	2	Im?	RNTR-06	0100149	0.323	0100207	2.007				
70	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	RNTR	205	99	1	Im?	RNTR-07	0100150	0.298	0100208	1.643				
71	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	RNTR	233	158	1	MtF	RNTR-08	0100151	0.237	0100209	1.331	0100183	0.632		
72	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	RNTR	192	90	0	MtF	RNTR-09	0100152	0.050	0100210	6.000				
73	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	RNTR	203	101	0	MtF	RNTR-10	0100153	0.156	0100211	5.050	0100184	0.417		
74	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	RNTR	198	101	0	Im?	RNTR-11	0100154	0.156	0100212	4.642				
75	Fairfax Lake	REF	17-46-18-W5	20-Dec-00	RNTR	203	101	0	Im?	RNTR-12	0100155	0.282	0100213	3.489				
76	Gregg River	EXP	8-49-24-W5	4-Oct-00	BKTR	204	115	3	MtM	BKTR-01	0002745	2.250	0003050	5.609				
77	Gregg River	EXP	8-49-24-W5	4-Oct-00	BKTR	216	132	3	MtF	BKTR-02	0002746	0.763	0003051	1.405	0002939	5.351		
78	Gregg River	EXP	8-49-24-W5	4-Oct-00	BKTR	202	101	3	MtF	BKTR-03	0002747	1.450	0003052	2.990	0002940	5.256		
79	Gregg River	EXP	8-49-24-W5	4-Oct-00	BKTR	180	64	4	MtF	BKTR-04	0002748	2.042	0003053	4.525	0002941	3.470		
80	Gregg River	EXP	8-49-24-W5	4-Oct-00	BKTR	151	49	2	MtM	BKTR-05	0002749	1.247	0003054	5.469				

Appendix II Selenium concentrations (µg/g wet weight) in fish tissues collected in west-central Alberta, 2000 (continued)

											MUSCLE		LIVER		GONAD		WHOLE FISH	
REF NO.	Water Body	Site Type	Legal Description	Sample Date	Spp.	Fork Lgth. (mm)	Total Wght. (g)	Age (ann.)	Mat.	Client ID	ARC_ REF Number	Se (µg/g)	ARC_REF Number	Se (µg/g)	ARC_ REF Number	Se (µg/g)	ARC_ REF Number	Se (µg/g)
81	Gregg River	EXP	8-49-24-W5	4-Oct-00	BKTR	148	45	2	MtM	BKTR-06	0002750	1.523	0003055	5.038				
82	Gregg River	EXP	8-49-24-W5	4-Oct-00	BKTR	154	40	3	MtF	BKTR-07	0002751	2.403	0003056	4.872	0002942	5.095		
83	Gregg River	EXP	8-49-24-W5	4-Oct-00	BKTR	142	34	1	MtM	BKTR-08	0002752	1.367	0003057	4.098				
84	Gregg River	EXP	8-49-24-W5	4-Oct-00	BKTR	130	28	2	MtM	BKTR-09	0002753	1.274	0003058	4.905				
85	Gregg River	EXP	8-49-24-W5	4-Oct-00	BKTR	126	25	1	MtM	BKTR-10	0002754	1.612	0003059	6.045				
86	Gregg River	EXP	8-49-24-W5	4-Oct-00	BKTR	130	26	1	MtM	BKTR-11	0002755	1.407	0003060	5.469				
87	Gregg River	EXP	8-49-24-W5	4-Oct-00	BKTR	116	17	1	MtM	BKTR-12	0002756	1.860	0003061	5.979				
88	Gregg River	EXP	8-49-24-W5	6-Oct-00	MNWH	91	7	ns	Im?	MNWF-01				ns			0002769	2.572
89	Gregg River	EXP	8-49-24-W5	6-Oct-00	MNWH	59	2	ns	Im?	MNWF-02				ns			0002770	2.103
90	Gregg River	EXP	8-49-24-W5	6-Oct-00	MNWH	65	2	ns	Im?	MNWF-03				ns			0002771	2.100
91	Gregg River	EXP	8-49-24-W5	6-Oct-00	MNWH	50	1	ns	Im?	MNWF-04				ns			0002772	2.443
92	Gregg River	EXP	8-49-24-W5	6-Oct-00	MNWH	60	2	ns	Im?	MNWF-05				ns			0002773	1.881
93	Gregg River	EXP	8-49-24-W5	6-Oct-00	MNWH	86	6	ns	Im?	MNWF-06				ns			0002774	2.355
94	Gregg River	EXP	8-49-24-W5	6-Oct-00	MNWH	61	2	ns	Im?	MNWF-07				ns			0002775	2.444
95	Gregg River	EXP	8-49-24-W5	6-Oct-00	MNWH	66	3	ns	Im?	MNWF-08				ns			0002776	2.199
96	Gregg River	EXP	8-49-24-W5	6-Oct-00	MNWH	60	2	ns	Im?	MNWF-09				ns			0002777	2.220
97	Gregg River	EXP	8-49-24-W5	6-Oct-00	MNWH	59	2	ns	Im?	MNWF-10				ns			0002778	2.060
98	Gregg River	EXP	8-49-24-W5	6-Oct-00	MNWH	89	7	ns	Im?	MNWF-11				ns			0002779	2.353
99	Gregg River	EXP	8-49-24-W5	6-Oct-00	MNWH	62	2	ns	Im?	MNWF-12				ns			0002757	0.817
100	Gregg River	EXP	8-49-24-W5	4-Oct-00	RNTR	128	22	ns	Im?	RNTR-01	0002758	3.324	0003062	8.132				
101	Gregg River	EXP	8-49-24-W5	6-Oct-00	RNTR	203	116	4	MtM	RNTR-02	0002759	1.191	0003063	7.674				
102	Gregg River	EXP	8-49-24-W5	6-Oct-00	RNTR	190	83	4	MtF	RNTR-03	0002760	1.253	0003064	3.915	0002943	8.567		
103	Gregg River	EXP	8-49-24-W5	6-Oct-00	RNTR	182	85	4	MtF	RNTR-04	0002761	1.346	0003065	4.285	0002944	7.588		
104	Gregg River	EXP	8-49-24-W5	6-Oct-00	RNTR	185	60	ns	MtF	RNTR-05	0002762	1.080	0003066	4.257	0002945	7.683		
105	Gregg River	EXP	8-49-24-W5	6-Oct-00	RNTR	148	39	3	ImF	RNTR-06	0002763	1.284	0003067	6.033	0002946	10.933		
106	Gregg River	EXP	8-49-24-W5	6-Oct-00	RNTR	142	29	3	ImF	RNTR-07	0002764	1.475	0003068	8.318	0002947	12.687		
107	Gregg River	EXP	8-49-24-W5	6-Oct-00	RNTR	120	19	2	Im?	RNTR-08	0002765	1.198	0003069	6.530				
108	Gregg River	EXP	8-49-24-W5	6-Oct-00	RNTR	103	12	2	ImF	RNTR-09	0002766	1.287	0003070	7.258	0002948	8.607		
109	Luscar Creek	EXP	16-47-23-W5	13-Oct-00	BKTR	236	130	3	MtF	BKTR-01	0100239	2.766		ns				
110	Luscar Creek	EXP	16-47-23-W5	13-Oct-00	BKTR	327	340	5	MtF	BKTR-02	0100240	3.580		ns				
111	Luscar Creek	EXP	16-47-23-W5	13-Oct-00	BKTR	192	61	3	MtF	BKTR-03	0100241	4.580		ns				
112	Luscar Creek	EXP	16-47-23-W5	13-Oct-00	BKTR	174	57	2	MtM	BKTR-04	0100242	2.179		ns				
113	Luscar Creek	EXP	16-47-23-W5	13-Oct-00	BKTR	205	96	2	MtF	BKTR-05	0100243	1.951		ns				
114	Luscar Creek	EXP	16-47-23-W5	13-Oct-00	BKTR	136	26	1	MtM	BKTR-06	0100244	2.606		ns				
115	Luscar Creek	EXP	16-47-23-W5	13-Oct-00	BKTR	225	131	4	MtM	BKTR-07	0100245	2.854		ns				
116	Luscar Creek	EXP	16-47-23-W5	13-Oct-00	BKTR	193	83	2	MtM	BKTR-08	0100246	7.769		ns				
117	Luscar Creek	EXP	16-47-23-W5	13-Oct-00	BKTR	197	97	2	MtM	BKTR-09	0100247	2.066		ns				
118	Luscar Creek	EXP	16-47-23-W5	13-Oct-00	BKTR	233	144	2	MtM	BKTR-10	0100248	2.229		ns				
119	Luscar Creek	EXP	16-47-23-W5	13-Oct-00	BKTR	172	54	2	MtM	BKTR-11	0100249	3.046		ns				
120	Luscar Creek	EXP	16-47-23-W5	13-Oct-00	BKTR	360	555	ns	MtF	BKTR-12	0100250	4.397		ns				
121	Luscar Creek	EXP	16-47-23-W5	13-Oct-00	BKTR	216	123	3	MtF	BKTR-13	0100251	2.552		ns				

Appendix II Selenium concentrations (µg/g wet weight) in fish tissues collected in west-central Alberta, 2000 (continued)

											MUSCLE		LIVER		GONAD		WHOLE FISH	
REF NO.	Water Body	Site Type	Legal Description	Sample Date	Spp.	Fork Lgth. (mm)	Total Wght. (g)	Age (ann.)	Mat.	Client ID	ARC_ REF Number	Se (µg/g)	ARC_REF Number	Se (µg/g)	ARC_ REF Number	Se (µg/g)	ARC_ REF Number	Se (µg/g)
122	Luscar Creek	EXP	16-47-23-W5	13-Oct-00	BKTR	238	166	5	MtF	BKTR-14	0100252	3.702		ns				
123	Luscar Creek	EXP	16-47-23-W5	13-Oct-00	BKTR	184	72	3	MtF	BKTR-15	0100253	5.252		ns				
124	Luscar Creek	EXP	16-47-23-W5	13-Oct-00	BKTR	232	148	3	MtF	BKTR-16	0100254	2.506		ns				
125	Luscar Creek	EXP	16-47-23-W5	13-Oct-00	BKTR	198	87	5	MtF	BKTR-17	0100255	2.346		ns				
126	Luscar Creek	EXP	16-47-23-W5	13-Oct-00	BKTR	184	68	3	MtF	BKTR-18	0100256	7.812		ns				
127	Luscar Creek	EXP	16-47-23-W5	6-Jun-00	RNTR	122	18	ns	ImM	LC-RT1	0001534	1.117		ns				
128	Luscar Creek	EXP	16-47-23-W5	6-Jun-00	RNTR	186	70	ns	MtM	LC-RT10	0001546	3.078		ns				
129	Luscar Creek	EXP	16-47-23-W5	8-Jun-00	RNTR	326	398	ns	MtF	LC-RT11	0001547	1.890		ns				
130	Luscar Creek	EXP	16-47-23-W5	8-Jun-00	RNTR	206	97	ns	MtF	LC-RT12	0001549	0.960		ns				
131	Luscar Creek	EXP	16-47-23-W5	8-Jun-00	RNTR	170	48	ns	MtF	LC-RT13	0001551	2.123		ns				
132	Luscar Creek	EXP	16-47-23-W5	8-Jun-00	RNTR	149	36	ns	MtF	LC-RT14	0001553	1.657		ns				
133	Luscar Creek	EXP	16-47-23-W5	8-Jun-00	RNTR	174	62	ns	MtM	LC-RT15	0001555	0.532		ns				
134	Luscar Creek	EXP	16-47-23-W5	8-Jun-00	RNTR	154	37	ns	MtM	LC-RT16	0001556	2.034		ns				
135	Luscar Creek	EXP	16-47-23-W5	8-Jun-00	RNTR	162	48	ns	MtM	LC-RT17	0001557	2.107		ns				
136	Luscar Creek	EXP	16-47-23-W5	6-Jun-00	RNTR	154	38	ns	ImM	LC-RT2	0001535	2.938		ns				
137	Luscar Creek	EXP	16-47-23-W5	6-Jun-00	RNTR	114	15	ns	ImM	LC-RT3	0001536	6.515		ns				
138	Luscar Creek	EXP	16-47-23-W5	6-Jun-00	RNTR	113	15	ns	MtF	LC-RT4	0001537	1.819		ns				
139	Luscar Creek	EXP	16-47-23-W5	6-Jun-00	RNTR	148	35	ns	MtF	LC-RT5	0001538	2.360		ns				
140	Luscar Creek	EXP	16-47-23-W5	6-Jun-00	RNTR	168	48	ns	MtF	LC-RT6	0001540	1.693		ns				
141	Luscar Creek	EXP	16-47-23-W5	6-Jun-00	RNTR	169	49	ns	MtF	LC-RT7	0001542	2.901		ns				
142	Luscar Creek	EXP	16-47-23-W5	6-Jun-00	RNTR	195	83	ns	MtM	LC-RT8	0001544	1.908		ns				
143	Luscar Creek	EXP	16-47-23-W5	6-Jun-00	RNTR	166	59	ns	MtM	LC-RT9	0001545	1.515		ns				
144	Luscar Creek	EXP	16-47-23-W5	2-Oct-00	MNWH	253	183	4	ImF	MNWF-01	0002780	1.224	0003071	10.069	0002951	8.020		
145	Luscar Creek	EXP	16-47-23-W5	2-Oct-00	MNWH	247	175	3	MtM	MNWF-02	0002781	1.507	0003072	7.683				
146	Luscar Creek	EXP	16-47-23-W5	2-Oct-00	MNWH	183	71	2	ImM	MNWF-03	0002782	1.860	0003073	9.383				
147	Luscar Creek	EXP	16-47-23-W5	2-Oct-00	MNWH	180	85	2	Im?	MNWF-04	0002783	2.070	0003074	9.790				
148	Luscar Creek	EXP	16-47-23-W5	2-Oct-00	MNWH	179	71	2	Im?	MNWF-05	0002784	1.610	0003075	8.837				
149	Luscar Creek	EXP	16-47-23-W5	2-Oct-00	MNWH	175	60	2	Im?	MNWF-06	0002785	2.529	0003076	11.359				
150	Luscar Creek	EXP	16-47-23-W5	2-Oct-00	MNWH	183	71	2	Im?	MNWF-07	0002786	1.818	0003077	10.637				
151	Luscar Creek	EXP	16-47-23-W5	2-Oct-00	MNWH	196	79	2	Im?	MNWF-08	0002787	2.077	0003078	10.098				
152	Luscar Creek	EXP	16-47-23-W5	2-Oct-00	MNWH	190	78	2	Im?	MNWF-09	0002788	2.192	0003079	8.751				
153	Luscar Creek	EXP	16-47-23-W5	2-Oct-00	MNWH	170	55	2	Im?	MNWF-10	0002789	2.160	0003080	11.332				
154	Luscar Creek	EXP	16-47-23-W5	2-Oct-00	MNWH	168	59	2	Im?	MNWF-11	0002790	1.815	0003081	8.091				
155	Luscar Creek	EXP	16-47-23-W5	2-Oct-00	MNWH	183	71	2	Im?	MNWF-12	0002791	2.785	0003082	11.111				
156	Luscar Creek	EXP	16-47-23-W5	2-Oct-00	MNWH	180	67	2	Im?	MNWF-13	0002792	1.953	0003083	8.616				
157	Luscar Creek	EXP	16-47-23-W5	2-Oct-00	MNWH	184	77	2	MtM	MNWF-14	0002793	1.968	0003084	8.635				
158	M. McLeod River	EXP	15-50-23-W5	25-Sep-00	LNSC	374	658	ns	MtM	LNSC-01	0100142	0.829	0100200	3.010				
159	M. McLeod River	EXP	15-50-23-W5	25-Sep-00	LNSC	382	834	ns	MtM	LNSC-02	0100143	0.524	0100201	1.725				
160	M. McLeod River	EXP	15-50-23-W5	25-Sep-00	MNWH	412	818	8	MtF	MNWF-01	0002815	1.165	0003104	6.247	0002965	6.950		
161	M. McLeod River	EXP	15-50-23-W5	25-Sep-00	MNWH	310	435	6	MtF	MNWF-02	0002816	1.563	0003105	6.030	0002966	6.416		
162	M. McLeod River	EXP	15-50-23-W5	25-Sep-00	MNWH	281	297	5	MtF	MNWF-03	0002817	1.062	0003106	6.446	0002967	8.494		

Appendix II Selenium concentrations (µg/g wet weight) in fish tissues collected in west-central Alberta, 2000 (continued)

											MUSCLE		LIVER		GONAD		WHOLE FISH	
REF NO.	Water Body	Site Type	Legal Description	Sample Date	Spp.	Fork Lgth. (mm)	Total Wght. (g)	Age (ann.)	Mat.	Client ID	ARC_ REF Number	Se (µg/g)	ARC_REF Number	Se (µg/g)	ARC_ REF Number	Se (µg/g)	ARC_ REF Number	Se (µg/g)
163	M. McLeod River	EXP	15-50-23-W5	25-Sep-00	MNWH	313	483	7	MtF	MNWF-04	0002818	1.048	0003107	6.072	0002968	7.380		
164	M. McLeod River	EXP	15-50-23-W5	25-Sep-00	MNWH	258	221	4	MtM	MNWF-05	0002819	1.229	0003108	8.604				
165	M. McLeod River	EXP	15-50-23-W5	25-Sep-00	MNWH	292	284	7	MtM	MNWF-06	0002820	1.533	0003109	12.425				
166	M. McLeod River	EXP	15-50-23-W5	25-Sep-00	MNWH	221	136	4	MtF	MNWF-07	0002821	1.968	0003110	7.396	0002969	12.403		
167	M. McLeod River	EXP	15-50-23-W5	25-Sep-00	MNWH	228	155	4	MtF	MNWF-08	0002822	1.106	0003111	7.308	0002970	8.706		
168	M. McLeod River	EXP	15-50-23-W5	25-Sep-00	MNWH	241	159	3	MtM	MNWF-09	0002823	2.235	0003112	11.810				
169	M. McLeod River	EXP	15-50-23-W5	25-Sep-00	MNWH	286	322	6	MtF	MNWF-10	0002824	1.364	0003113	5.679	0002971	6.387		
170	M. McLeod River	EXP	15-50-23-W5	25-Sep-00	MNWH	278	209	5	MtF	MNWF-11	0002825	1.215	0003114	4.746	0002972	10.425		
171	M. McLeod River	EXP	15-50-23-W5	25-Sep-00	MNWH	260	243	5	MtF	MNWF-12	0002826	1.847	0003115	6.000	0002973	9.609		
172	M. McLeod River	EXP	15-50-23-W5	25-Sep-00	RNTR	210	128	3	MtF	RNTR-01	0002827	2.226	0003116	10.516	0002974	17.805		
173	M. McLeod River	EXP	15-50-23-W5	25-Sep-00	RNTR	228	148	3	MtF	RNTR-02	0002828	2.640	0003117	8.708	0002975	14.413		
174	M. McLeod River	EXP	15-50-23-W5	25-Sep-00	RNTR	228	147	3	MtF	RNTR-03	0002829	2.145	0003118	8.041	0002976	13.914		
175	M. McLeod River	EXP	15-50-23-W5	25-Sep-00	RNTR	181	68	2	MtM	RNTR-04	0002830	1.693	0003119	11.586				
176	M. McLeod River	EXP	15-50-23-W5	25-Sep-00	RNTR	220	137	3	MtM	RNTR-05	0002831	0.740	0003120	5.483				
177	M. McLeod River	EXP	15-50-23-W5	25-Sep-00	RNTR	189	72	2	MtM	RNTR-06	0002832	1.970	0003121	23.479				
178	M. McLeod River	EXP	15-50-23-W5	25-Sep-00	RNTR	184	70	2	Im?	RNTR-07	0002833	2.170	0003122	12.395				
179	M. McLeod River	EXP	15-50-23-W5	25-Sep-00	RNTR	161	47	2	Im?	RNTR-08	0002834	1.989	0003123	12.480				
180	M. McLeod River	EXP	15-50-23-W5	25-Sep-00	RNTR	152	39	2	Im?	RNTR-09	0002835	1.781	0003124	22.963				
181	M. McLeod River	EXP	15-50-23-W5	25-Sep-00	RNTR	111	16	1	Im?	RNTR-10	0002836	2.067	0003125	9.988				
182	MacKenzie Creek	REF	20-47-22-W5	18-Oct-00	MNWH	215	123	3	ImF	MNWF-01	0002794	1.366	0003085	5.785	0002952	10.079		
183	MacKenzie Creek	REF	20-47-22-W5	18-Oct-00	MNWH	207	99	2	Im?	MNWF-02	0002795	1.985	0003086	8.319				
184	MacKenzie Creek	REF	20-47-22-W5	18-Oct-00	MNWH	202	88	3	ImF	MNWF-03	0002796	1.368	0003087	5.642	0002953	7.414		
185	MacKenzie Creek	REF	20-47-22-W5	18-Oct-00	MNWH	193	82	2	ImM	MNWF-04	0002797	1.520	0003088	5.540				
186	MacKenzie Creek	REF	20-47-22-W5	18-Oct-00	MNWH	239	131	3	MtF	MNWF-05	0002798	0.995	0003089	6.488	0002954	7.939		
187	MacKenzie Creek	REF	20-47-22-W5	18-Oct-00	MNWH	187	73	2	MtF	MNWF-06	0002799	1.853	0003090	9.828	0002955	3.476		
188	MacKenzie Creek	REF	20-47-22-W5	18-Oct-00	MNWH	195	79	2	MtF	MNWF-07	0002800	1.575	0003091	7.414	0002956	5.984		
189	MacKenzie Creek	REF	20-47-22-W5	18-Oct-00	MNWH	195	76	2	MtF	MNWF-08	0002801	2.412	0003092	10.491	0002957	5.782		
190	MacKenzie Creek	REF	20-47-22-W5	18-Oct-00	MNWH	187	71	2	MtF	MNWF-09	0002802	2.172	0003093	12.472	0002958	3.785		
191	MacKenzie Creek	REF	20-47-22-W5	18-Oct-00	MNWH	194	69	2	ImF	MNWF-10	0002803	2.165	0003094	10.008				
192	MacKenzie Creek	REF	20-47-22-W5	18-Oct-00	MNWH	150	34	1	Im?	MNWF-11	0002804	1.935	0003095	9.012				
193	MacKenzie Creek	REF	20-47-22-W5	18-Oct-00	MNWH	159	38	1	Im?	MNWF-12	0002805	2.761	0003096	9.467				
194	MacKenzie Creek	REF	20-47-22-W5	18-Oct-00	RNTR	145	33	4	MtF	RNTR-01	0002806	1.163	0003097	8.513	0002959	11.600		
195	MacKenzie Creek	REF	20-47-22-W5	18-Oct-00	RNTR	119	19	3	MtF	RNTR-02	0002807	0.871	0003098	12.071	0002960	19.971		
196	MacKenzie Creek	REF	20-47-22-W5	18-Oct-00	RNTR	189	79	4	MtM	RNTR-03	0002808	1.139	0003099	10.600				
197	MacKenzie Creek	REF	20-47-22-W5	18-Oct-00	RNTR	138	34	3	MtM	RNTR-04	0002809	0.834	0003100	6.095				
198	MacKenzie Creek	REF	20-47-22-W5	18-Oct-00	RNTR	167	63	5	MtF	RNTR-05	0002810	0.881	0003101	3.807	0002961	6.783		
199	MacKenzie Creek	REF	20-47-22-W5	18-Oct-00	RNTR	165	59	6	MtF	RNTR-06	0002811	0.723	0003102	4.001	0002962	6.975		
200	MacKenzie Creek	REF	20-47-22-W5	18-Oct-00	RNTR	122	18	3	MtF	RNTR-07	0002812	1.064	0003103	8.611	0002963	8.151		
201	Muskeg River	REF	15-57-6-W6	26-Oct-00	BKTR	193	74	2	MtF	BKTR-01	0002837	0.906	0003126	2.721	0002977	2.175		
202	Muskeg River	REF	15-57-6-W6	26-Oct-00	BLTR	205	79	3	Im?	BLTR-01	0002838	0.808	0003127	3.765				
203	Muskeg River	REF	15-57-6-W6	26-Oct-00	BLTR	152	34	2	Im?	BLTR-02	0002839	0.559	0003128	2.562				

Appendix II Selenium concentrations (µg/g wet weight) in fish tissues collected in west-central Alberta, 2000 (continued)

											MUSCLE		LIVER		GONAD		WHOLE FISH	
REF NO.	Water Body	Site Type	Legal Description	Sample Date	Spp.	Fork Lgth. (mm)	Total Wght. (g)	Age (ann.)	Mat.	Client ID	ARC_ REF Number	Se (µg/g)	ARC_REF Number	Se (µg/g)	ARC_ REF Number	Se (µg/g)	ARC_ REF Number	Se (µg/g)
204	Muskeg River	REF	15-57-6-W6	26-Oct-00	BLTR	106	11	1	Im?	BLTR-03	0002840	0.823	0003129	3.104				
205	Muskeg River	REF	15-57-6-W6	26-Oct-00	BLTR	171	52	2	Im?	BLTR-04	0002841	0.784	0003130	2.687				
206	Muskeg River	REF	15-57-6-W6	26-Oct-00	BLTR	158	35	2	ImF	BLTR-05	0002842	0.576	0003131	1.941	0002978	1.000		
207	Muskeg River	REF	15-57-6-W6	26-Oct-00	BLTR	151	35	2	Im?	BLTR-06	0002843	0.612	0003132	2.555				
208	Muskeg River	REF	15-57-6-W6	26-Oct-00	BLTR	113	15	2	Im?	BLTR-07	0002844	0.688	0003133	2.802				
209	Muskeg River	REF	15-57-6-W6	26-Oct-00	BLTR	116	16	1	Im?	BLTR-08	0002845	0.708	0003134	2.826				
210	Muskeg River	REF	15-57-6-W6	26-Oct-00	BLTR	120	18	ns	Im?	BLTR-09	0002846	0.814	0003135	3.019				
211	Muskeg River	REF	15-57-6-W6	26-Oct-00	BLTR	118	18	1	Im?	BLTR-10	0002847	0.653	0003136	2.018				
212	Muskeg River	REF	15-57-6-W6	26-Oct-00	BLTR	124	18	1	Im?	BLTR-11	0002848	0.795	0003137	2.697				
213	Muskeg River	REF	15-57-6-W6	26-Oct-00	BLTR	115	16	ns	Im?	BLTR-12	0002849	0.623	0003138	ns				
214	Muskeg River	REF	15-57-6-W6	26-Oct-00	RNTR	193	44	2	ImF	RNTR-01	0002850	0.859	0003139	9.138	0002979	2.353		
215	Muskeg River	REF	15-57-6-W6	26-Oct-00	RNTR	130	25	2	MtM	RNTR-02	0002851	0.883	0003140	6.322				
216	Muskeg River	REF	15-57-6-W6	26-Oct-00	RNTR	137	30	2	ImF	RNTR-03	0002852	0.756	0003141	8.173	0002980	5.224		
217	Muskeg River	REF	15-57-6-W6	26-Oct-00	RNTR	148	34	2	MtM	RNTR-04	0002853	0.831	0003142	12.409				
218	Muskeg River	REF	15-57-6-W6	26-Oct-00	RNTR	138	24	2	ImF	RNTR-05	0002854	0.947	0003143	21.293	0002981	2.959		
219	Muskeg River	REF	15-57-6-W6	26-Oct-00	RNTR	96	10	1	Im?	RNTR-06	0002855	1.006	0003144	7.600				
220	Muskeg River	REF	15-57-6-W6	26-Oct-00	RNTR	91	8	1	Im?	RNTR-07	0002856	0.815	0003145	7.275				
221	Muskeg River	REF	15-57-6-W6	26-Oct-00	RNTR	92	8	1	Im?	RNTR-08	0002857	0.942	0003146	7.711				
222	Muskeg River	REF	15-57-6-W6	26-Oct-00	RNTR	86	7	1	Im?	RNTR-09	0002858	0.780	0003147	7.506				
223	Muskeg River	REF	15-57-6-W6	26-Oct-00	RNTR	110	13	1	ImF	RNTR-10	0002859	0.974	0003148	9.121	0002982	3.301		
224	Muskeg River	REF	15-57-6-W6	26-Oct-00	RNTR	86	6	1	Im?	RNTR-11	0002860	1.088	0003149	8.083				
225	Muskeg River	REF	15-57-6-W6	26-Oct-00	RNTR	n/a	n/a	1	n/a	RNTR-12	0002863	0.617	0003150	6.169				
226	Sheep Creek	EXP	5-59-7-W6	25-Oct-00	BLTR	289	240	6	MtM	BLTR-01	0002864	0.279	0003151	2.255				
227	Sheep Creek	EXP	5-59-7-W6	25-Oct-00	BLTR	373	517	10	ImF	BLTR-02	0002865	0.781	0003152	4.316	0002983	2.941		
228	Sheep Creek	EXP	5-59-7-W6	25-Oct-00	BLTR	347	393	7	MgF	BLTR-03	0002866	0.848	0003153	3.996	0002984	2.564		
229	Sheep Creek	EXP	5-59-7-W6	25-Oct-00	BLTR	295	233	6	Im?	BLTR-04	0002867	0.764	0003154	3.842				
230	Sheep Creek	EXP	5-59-7-W6	25-Oct-00	BLTR	257	151	4	Im?	BLTR-05	0002868	0.758	0003155	3.512				
231	Sheep Creek	EXP	5-59-7-W6	25-Oct-00	BLTR	293	278	7	MgF	BLTR-06	0002869	0.739	0003156	3.211	0002985	2.749		
232	Sheep Creek	EXP	5-59-7-W6	25-Oct-00	BLTR	393	583	10	MgF	BLTR-07	0002870	0.827	0003157	4.021	0002986	2.154		
233	Sheep Creek	EXP	5-59-7-W6	25-Oct-00	BLTR	360	441	8	MgF	BLTR-08	0002871	0.755	0003158	4.309	0002987	2.784		
234	Sheep Creek	EXP	5-59-7-W6	25-Oct-00	BLTR	362	426	9	MgF	BLTR-09	0002872	0.698	0003159	3.622	0002988	1.954		
235	Sheep Creek	EXP	5-59-7-W6	25-Oct-00	BLTR	295	242	6	Im?	BLTR-10	0002873	0.576	0003160	4.037				
236	Sheep Creek	EXP	5-59-7-W6	25-Oct-00	BLTR	430	761	7	MgF	BLTR-11	0002874	0.716	0003161	3.285	0002989	2.488		
237	Sheep Creek	EXP	5-59-7-W6	25-Oct-00	BLTR	349	450	7	MgF	BLTR-12	0002875	0.656	0003162	2.886	0002990	2.535		
238	Smoky River	EXP	31-58-7-W6	27-Sep-00	ARGR	318	517	7	MtF	ARGR-01	0100166	0.562	0100222	3.690	0100191	7.902		
239	Smoky River	EXP	31-58-7-W6	27-Sep-00	ARGR	299	222	4	MtM	ARGR-02	0100167	0.929	0100223	2.825				
240	Smoky River	EXP	31-58-7-W6	27-Sep-00	ARGR	223	146	2	ImF	ARGR-03	0100168	0.829	0100224	3.602	0100192	4.200		
241	Smoky River	EXP	31-58-7-W6	27-Sep-00	ARGR	291	330	3	MtM	ARGR-04	0100169	0.961	0100225	3.580				
242	Smoky River	EXP	31-58-7-W6	27-Sep-00	ARGR	243	202	2	ImM	ARGR-05	0100170	0.870	0100226	4.309				
243	Smoky River	EXP	31-58-7-W6	27-Sep-00	ARGR	295	367	4	MtM	ARGR-06	0100171	0.769	0100227	5.064				
244	Smoky River	EXP	31-58-7-W6	27-Sep-00	BLTR	515	1445	9	MtF	BLTR-01	0002876	0.414	0003163	1.425	0002991	2.188		

Appendix II Selenium concentrations (µg/g wet weight) in fish tissues collected in west-central Alberta, 2000 (continued)

											MUSCLE		LIVER		GONAD		WHOLE FISH	
REF NO.	Water Body	Site Type	Legal Description	Sample Date	Spp.	Fork Lgth. (mm)	Total Wght. (g)	Age (ann.)	Mat.	Client ID	ARC_ REF Number	Se (µg/g)	ARC_REF Number	Se (µg/g)	ARC_ REF Number	Se (µg/g)	ARC_ REF Number	Se (µg/g)
245	Smoky River	EXP	31-58-7-W6	27-Sep-00	BLTR	384	599	6	Im?	BLTR-02	0002877	0.311	0003164	1.285				
246	Smoky River	EXP	31-58-7-W6	27-Sep-00	BLTR	343	433	5	MtF	BLTR-03	0002878	0.241	0003165	1.469	0002992	1.977		
247	Smoky River	EXP	31-58-7-W6	27-Sep-00	BLTR	295	328	4	ImF	BLTR-04	0002879	0.427	0003166	1.477	0002993	2.027		
248	Smoky River	EXP	31-58-7-W6	27-Sep-00	BLTR	356	473	5	Im?	BLTR-05	0002880	0.393	0003167	1.560				
249	Smoky River	EXP	31-58-7-W6	27-Sep-00	BLTR	332	418	5	MtM	BLTR-06	0002881	0.327	0003168	1.747				
250	Smoky River	EXP	31-58-7-W6	27-Sep-00	BLTR	279	196	3	MtF	BLTR-07	0002882	0.415	0003169	1.644	0002994	2.143		
251	Smoky River	EXP	31-58-7-W6	27-Sep-00	LNSC	385	753	n/a	MtF	LNSC-01	0100172	0.623	0100228	1.676	0100193	0.830		
252	Smoky River	EXP	31-58-7-W6	27-Sep-00	LNSC	402	805	n/a	MtF	LNSC-02	0100173	0.342	0100229	1.423	0100194	0.783		
253	Smoky River	EXP	31-58-7-W6	27-Sep-00	LNSC	316	430	n/a	MtM	LNSC-03	0100174	0.340	0100230	1.248				
254	Smoky River	EXP	31-58-7-W6	27-Sep-00	LNSC	356	601	n/a	MtM	LNSC-04	0100175	0.568	0100231	1.351				
255	Smoky River	EXP	31-58-7-W6	27-Sep-00	LNSC	359	615	n/a	MtM	LNSC-05	0100176	0.490	0100232	1.012				
256	Smoky River	EXP	31-58-7-W6	27-Sep-00	LNSC	361	563	n/a	MtM	LNSC-06	0100177	0.445	0100233	0.990				
257	Smoky River	EXP	31-58-7-W6	27-Sep-00	LNSC	360	584	n/a	MtF	LNSC-07	0100178	0.356	0100234	0.302	0100195	0.607		
258	Smoky River	EXP	31-58-7-W6	27-Sep-00	LNSC	349	554	n/a	MtF	LNSC-08	0100179	0.530	0100235	1.020	0100196	0.839		
259	Smoky River	EXP	31-58-7-W6	27-Sep-00	LNSC	385	715	n/a	MtF	LNSC-09	0100180	0.481	0100236	0.627	0100197	0.793		
260	Smoky River	EXP	31-58-7-W6	27-Sep-00	LNSC	361	577	n/a	MtF	LNSC-10	0100181	0.450	0100237	0.932	0100198	1.153		
261	Smoky River	EXP	31-58-7-W6	27-Sep-00	LNSC	393	714	n/a	MtF	LNSC-11	0100182	0.407	0100238	0.976	0100199	0.852		
262	Smoky River	EXP	31-58-7-W6	27-Sep-00	MNWH	437	1040	13	MtM	MNWF-01	0002883	0.496	0003170	4.799				
263	Smoky River	EXP	31-58-7-W6	27-Sep-00	MNWH	485	1164	20	MtM	MNWF-02	0002884	0.800	0003171	3.133				
264	Smoky River	EXP	31-58-7-W6	27-Sep-00	MNWH	319	357	ns	MtF	MNWF-03	0002885	0.367	0003172	1.352	0002995	4.900		
265	Smoky River	EXP	31-58-7-W6	27-Sep-00	MNWH	240	198	5	MtF	MNWF-04	0002886	0.610	0003173	3.000	0002996	6.731		
266	Smoky River	EXP	31-58-7-W6	27-Sep-00	MNWH	255	204	5	MtM	MNWF-05	0002887	0.780	0003174	10.149				
267	Smoky River	EXP	31-58-7-W6	27-Sep-00	MNWH	274	278	5	MtF	MNWF-06	0002888	0.712	0003175	1.811	0002997	6.594		
268	Smoky River	EXP	31-58-7-W6	27-Sep-00	MNWH	255	198	4	MtM	MNWF-07	0002889	0.648	0003176	8.055				
269	Smoky River	EXP	31-58-7-W6	27-Sep-00	MNWH	291	223	5	MtM	MNWF-08	0002890	0.786	0003177	14.995				
270	Smoky River	EXP	31-58-7-W6	27-Sep-00	MNWH	257	204	4	MtF	MNWF-09	0002891	0.603	0003178	1.612	0002998	3.456		
271	Smoky River	EXP	31-58-7-W6	27-Sep-00	MNWH	248	202	5	MtM	MNWF-10	0002892	0.851	0003179	12.591				
272	Smoky River	EXP	31-58-7-W6	27-Sep-00	MNWH	245	187	4	MtM	MNWF-11	0002893	0.815	0003180	7.256				
273	Smoky River	EXP	31-58-7-W6	27-Sep-00	MNWH	243	168	5	ImF	MNWF-12	0002894	0.815	0003181	5.649	0002999	16.641		
274	Smoky River	EXP	31-58-7-W6	27-Sep-00	RNTR	285	311	5	MtF	RNTR-01	0002895	0.461	0003182	6.775	0003000	4.961		
275	Smoky River	EXP	31-58-7-W6	27-Sep-00	RNTR	280	283	5	MtF	RNTR-02	0002896	0.525	0003183	3.877	0003001	6.266		
276	Smoky River	EXP	31-58-7-W6	27-Sep-00	RNTR	250	201	3	ImM	RNTR-03	0002897	0.630	0003184	11.926		ns		
277	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	BKTR	235	154	3	MtF	BKTR-01	0002898	1.227	0003185	2.979	0003002	5.772		
278	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	BKTR	192	93	2	MtM	BKTR-02	0002899	1.194	0003186	6.873				
279	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	BKTR	204	103	ns	MtF	BKTR-03	0002900	1.006	0003187	2.203	0003003	6.237		
280	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	BKTR	191	77	3	MgF	BKTR-04	0002901	1.051	0003188	3.946	0003004	9.365		
281	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	BKTR	168	60	2	MgF	BKTR-05	0002902	1.308	0003189	4.900	0003005	8.876		
282	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	BKTR	158	43	2	MgF	BKTR-06	0002903	1.392	0003190	4.984	0003006	15.801		
283	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	BKTR	133	31	2	MgF	BKTR-07	0002904	2.278	0003191	7.979	0003007	5.124		
284	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	MNWH	288	344	4	MtM	MNWF-01	0002905	1.540	0003192	10.039				
285	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	MNWH	286	343	4	MtM	MNWF-02	0002906	1.097	0003193	8.342				

Appendix II Selenium concentrations (µg/g wet weight) in fish tissues collected in west-central Alberta, 2000 (continued)

											MUSCLE		LIVER		GONAD		WHOLE FISH	
REF NO.	Water Body	Site Type	Legal Description	Sample Date	Spp.	Fork Lgth. (mm)	Total Wght. (g)	Age (ann.)	Mat.	Client ID	ARC_ REF Number	Se (µg/g)	ARC_REF Number	Se (µg/g)	ARC_ REF Number	Se (µg/g)	ARC_ REF Number	Se (µg/g)
286	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	MNWH	389	837	5	MtF	MNWF-03	0002907	0.779	0003194	2.931	0003008	6.029		
287	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	MNWH	326	461	6	MtF	MNWF-04	0002908	1.301	0003195	7.141	0003009	9.493		
288	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	MNWH	242	188	3	MtF	MNWF-05	0002909	0.994	0003196	5.747	0003010	9.173		
289	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	MNWH	290	344	4	MtF	MNWF-06	0002910	0.901	0003197	5.201	0003011	7.248		
290	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	MNWH	315	402	6	MtF	MNWF-07	0002911	1.341	0003198	7.716	0003012	8.543		
291	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	MNWH	271	263	4	MtM	MNWF-08	0002912	1.227	0003199	12.861				
292	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	MNWH	274	303	4	MtF	MNWF-09	0002913	0.940	0003200	6.599	0003013	7.411		
293	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	MNWH	275	276	4	MtM	MNWF-10	0002914	1.103	0003201	7.410				
294	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	MNWH	301	384	5	MtF	MNWF-11	0002915	1.003	0003202	6.033	0003014	6.575		
295	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	MNWH	317	441	7	MtF	MNWF-12	0002916	1.455	0003203	4.867	0003015	8.424		
296	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	MNWH	275	244	4	MtM	MNWF-13	0002917	1.465	0003204	10.130				
297	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	MNWH	245	190	3	MtF	MNWF-14	0002918	1.305	0003205	6.459	0003016	9.942		
298	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	RNTR	224	141	4	MtF	RNTR-01	0002919	1.014	0003206	7.874	0003017	14.290		
299	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	RNTR	171	53	3	MtF	RNTR-02	0002920	1.159	0003207	10.061	0003018	23.116		
300	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	RNTR	154	44	2	MtM	RNTR-03	0002921	1.074	0003208	9.062				
301	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	RNTR	138	32	2	MgF	RNTR-04	0002922	1.286	0003209	8.348	0003019	9.438		
302	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	RNTR	146	35	2	MgF	RNTR-05	0002923	1.329	0003210	8.501	0003020	11.141		
303	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	RNTR	143	37	2	MtM	RNTR-06	0002924	1.305	0003211	9.982				
304	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	RNTR	147	ns	2	MtM	RNTR-07	0002925	1.415	0003212	11.801				
305	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	RNTR	151	38	2	MtF	RNTR-08	0002926	1.008	0003213	9.726	0003021	20.460		
306	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	RNTR	142	37	2	MtM	RNTR-09	0002927	1.295	0003214	7.086				
307	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	RNTR	127	25	2	MtM	RNTR-10	0002928	1.003	0003215	6.250				
308	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	RNTR	136	29	2	Im?	RNTR-11	0002929	0.898	0003216	5.880				
309	U. McLeod River	EXP	30-47-22-W5	26-Sep-00	RNTR	123	19	2	ImF	RNTR-12	0002930	1.086	0003217	8.452				
310	Whitehorse Creek	REF	24-46-24-W5	23-Oct-00	RNTR	311	426	5	MtF	RNTR-01	0002931	0.491	0003218	2.310	0003022	6.122		
311	Whitehorse Creek	REF	24-46-24-W5	23-Oct-00	RNTR	199	117	4	MtF	RNTR-02	0002932	0.676	0003219	4.341	0003023	7.782		
312	Whitehorse Creek	REF	24-46-24-W5	23-Oct-00	RNTR	232	178	3	MtF	RNTR-03	0002933	0.895	0003220	2.373	0003024	6.310		
313	Whitehorse Creek	REF	24-46-24-W5	23-Oct-00	RNTR	174	69	3	MtF	RNTR-04	0002934	0.538	0003221	3.178	0003025	5.228		

Site Type: REF = reference; EXP = exposed
Spp: Species = RNTR (rainbow trout); BLTR (bull trout); BKTR (brook trout); ARGR (Arctic grayling); MNWH (mountain whitefish); LNSC (longnose sucker)
Age (ann.): ann. = number of annuli
Mat.: Mat. = maturity: ImM - immature male; MgM - maturing male; MtM - mature male; GrM - green male; RpM - ripe male; SpM - spent male
ImF - immature female; MgF - maturing female; MtF - mature female; GrF - green female; RpF - ripe female; SpF - spent female
ns: no sample

Appendix III Selenium concentrations (µg/g wet weight) in fish tissues collected in west-central Alberta, 2001

											MUSCLE		
REF NO.	Water Body	Site Type	Legal Description	Sample Date	Spp.	Fork Lgth. (mm)	Total Wght. (g)	Age (ann.)	Mat.	Client ID	ARC_REF Number		Se* (µg/g)
1	Cold Creek	REF	28-50-25-W5	7-Sep-01	BKTR	200	108	ns	ns	BKTR01	0200036		0.686
2	Cold Creek	REF	28-50-25-W5	7-Sep-01	BKTR	222	134	ns	ns	BKTR02	0200037	<	0.400
3	Cold Creek	REF	28-50-25-W5	7-Sep-01	BKTR	157	51	ns	ns	BKTR03	0200038	<	0.400
4	Cold Creek	REF	28-50-25-W5	7-Sep-01	BKTR	181	86	ns	ns	BKTR04	0200039		0.640
5	Cold Creek	REF	28-50-25-W5	7-Sep-01	BKTR	187	78	ns	ns	BKTR05	0200040	<	0.500
6	Cold Creek	REF	28-50-25-W5	7-Sep-01	BKTR	163	46	ns	ns	BKTR06	0200041	<	0.200
7	Cold Creek	REF	28-50-25-W5	7-Sep-01	BKTR	175	70	ns	ns	BKTR07	0200042	<	0.300
8	Cold Creek	REF	28-50-25-W5	7-Sep-01	BKTR	152	44	ns	ns	BKTR08	0200043	<	0.600
9	Cold Creek	REF	28-50-25-W5	7-Sep-01	BKTR	177	76	ns	ns	BKTR09	0200044	<	0.600
10	Cold Creek	REF	28-50-25-W5	7-Sep-01	BKTR	196	84	ns	ns	BKTR10	0200045	<	0.400
11	Deerlick Creek	REF	14-48-23-W5	6-Sep-01	BLTR	243	154	ns	ns	BLTR01	0200096		0.624
12	Deerlick Creek	REF	14-48-23-W5	6-Sep-01	RNTR	194	87	ns	ns	RNTR01	0200086		1.870
13	Deerlick Creek	REF	14-48-23-W5	6-Sep-01	RNTR	168	60	ns	ns	RNTR02	0200087	<	0.300
14	Deerlick Creek	REF	14-48-23-W5	6-Sep-01	RNTR	218	118	ns	ns	RNTR03	0200088	<	0.300
15	Deerlick Creek	REF	14-48-23-W5	6-Sep-01	RNTR	238	157	ns	ns	RNTR04	0200089	<	0.400
16	Deerlick Creek	REF	14-48-23-W5	6-Sep-01	RNTR	188	81	ns	ns	RNTR05	0200090	<	0.500
17	Deerlick Creek	REF	14-48-23-W5	6-Sep-01	RNTR	167	57	ns	ns	RNTR06	0200091	<	0.500
18	Deerlick Creek	REF	14-48-23-W5	6-Sep-01	RNTR	203	99	ns	ns	RNTR07	0200092	<	0.400
19	Deerlick Creek	REF	14-48-23-W5	6-Sep-01	RNTR	176	68	ns	ns	RNTR08	0200093	<	0.500
20	Deerlick Creek	REF	14-48-23-W5	6-Sep-01	RNTR	200	83	ns	ns	RNTR09	0200094	<	2.000
21	Deerlick Creek	REF	14-48-23-W5	6-Sep-01	RNTR	179	70	ns	ns	RNTR10	0200095	<	0.700
22	Gregg River	EXP	8-49-24-W5	10-Sep-01	MNWH	249	190	ns	ns	MNWH01	0200064		0.700
23	Gregg River	EXP	8-49-24-W5	10-Sep-01	MNWH	222	110	ns	ns	MNWH03	0200066		5.330
24	Gregg River	EXP	8-49-24-W5	10-Sep-01	MNWH	214	93	ns	ns	MNWH09A	0200073		1.664
25	Gregg River	EXP	8-49-24-W5	10-Sep-01	MNWH	177	64	ns	ns	MNWH10A	0200075		1.838
26	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	BKTR	198	94	ns	ns	BKTR01	0200002		2.987
27	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	BKTR	194	89	ns	ns	BKTR02	0200003		1.854
28	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	BKTR	226	160	ns	ns	BKTR04	0200004		3.910
29	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	BKTR	191	83	ns	ns	BKTR05	0200005		3.391
30	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	BKTR	190	85	ns	ns	BKTR06	0200006		7.460
31	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	BKTR	231	162	ns	ns	BKTR07	0200007		3.041
32	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	BKTR	195	86	ns	ns	BKTR08	0200008		2.267
33	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	BKTR	203	99	ns	ns	BKTR09	0200009		5.949
34	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	BKTR	170	61	ns	ns	BKTR10	0200010		2.078
35	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	BLTR	197	85	ns	ns	BLTR01	0200011		2.052
36	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	BLTR	267	177	ns	ns	BLTR02	0200012		1.267
37	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	BLTR	235	134	ns	ns	BLTR03	0200013		2.271
38	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	BLTR	226	111	ns	ns	BLTR04	0200014		1.286
39	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	BLTR	221	100	ns	ns	BLTR05	0200015		2.194
40	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	BLTR	199	87	ns	ns	BLTR06	0200016		1.992
41	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	BLTR	309	270	ns	ns	BLTR07	0200017		2.370
42	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	BLTR	185	72	ns	ns	BLTR08	0200018		1.088
43	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	BLTR	170	53	ns	ns	BLTR09	0200019		3.614
44	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	BLTR	187	61	ns	ns	BLTR10	0200020		2.374
45	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	MNWH	226	144	ns	ns	MNWH01	0200021		3.134
46	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	MNWH	180	73	ns	ns	MNWH02	0200022		5.029

Appendix III Selenium concentrations (µg/g wet weight) in fish tissues collected in west-central Alberta, 2001 (continued)

											MUSCLE		
REF NO.	Water Body	Site Type	Legal Description	Sample Date	Spp.	Fork Lgth. (mm)	Total Wght. (g)	Age (ann.)	Mat.	Client ID	ARC_REF Number		Se* (µg/g)
47	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	MNWH	169	64	ns	ns	MNWH03	0200023		0.721
48	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	MNWH	173	66	ns	ns	MNWH04	0200024		3.119
49	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	MNWH	195	82	ns	ns	MNWH05	0200025		2.338
50	Luscar Creek	EXP	16-47-23-W5	6-Sep-01	MNWH	n/a	n/a	ns	ns	MNWH06	0200027		2.714
51	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	MNWH	181	78	ns	ns	MNWH07	0200028		3.032
52	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	MNWH	155	52	ns	ns	MNWH08	0200029		2.119
53	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	MNWH	171	52	ns	ns	MNWH09	0200030		3.893
54	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	RNTR	98	10	ns	ns	RNTR01	0200031		2.812
55	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	RNTR	211	129	ns	ns	RNTR02	0200032		1.747
56	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	RNTR	185	87	ns	ns	RNTR03	0200033		2.210
57	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	RNTR	56	2	ns	ns	RNTR04	0200034		2.209
58	Luscar Creek	EXP	16-47-23-W5	5-Sep-01	RNTR	90	9	ns	ns	RNTR05	0200035		2.419
59	M. McLeod River	EXP	15-50-23-W5	11-Sep-01	BKTR	212	114	ns	ns	BKTR01	0200097		1.201
60	M. McLeod River	EXP	15-50-23-W5	11-Sep-01	BKTR	165	46	ns	ns	BKTR02	0200098		1.859
61	M. McLeod River	EXP	15-50-23-W5	11-Sep-01	BKTR	114	13	ns	ns	BKTR03	0200099		1.561
62	M. McLeod River	EXP	15-50-23-W5	11-Sep-01	BKTR	102	9	ns	ns	BKTR04	0200100	<	0.300
63	M. McLeod River	EXP	15-50-23-W5	11-Sep-01	BKTR	156	46	ns	ns	BKTR05	0200101		1.383
64	M. McLeod River	EXP	15-50-23-W5	11-Sep-01	BLTR	217	113	ns	ns	BLTR01	0200102		0.927
65	M. McLeod River	EXP	15-50-23-W5	11-Sep-01	BLTR	153	31	ns	ns	BLTR02	0200103		1.598
66	M. McLeod River	EXP	15-50-23-W5	11-Sep-01	MNWH	253	222	ns	ns	MNWH01	0200105		2.146
67	M. McLeod River	EXP	15-50-23-W5	11-Sep-01	MNWH	210	113	ns	ns	MNWH02	0200106		1.110
68	M. McLeod River	EXP	15-50-23-W5	11-Sep-01	MNWH	256	209	ns	ns	MNWH03	0200107		0.944
69	M. McLeod River	EXP	15-50-23-W5	11-Sep-01	MNWH	148	31	ns	ns	MNWH04	0200108		3.240
70	M. McLeod River	EXP	15-50-23-W5	11-Sep-01	MNWH	181	76	ns	ns	MNWH05	0200109		2.051
71	M. McLeod River	EXP	15-50-23-W5	11-Sep-01	MNWH	253	187	ns	ns	MNWH06	0200110		3.532
72	M. McLeod River	EXP	15-50-23-W5	11-Sep-01	MNWH	204	99	ns	ns	MNWH07	0200111		2.339
73	M. McLeod River	EXP	15-50-23-W5	11-Sep-01	MNWH	230	151	ns	ns	MNWH08	0200112		2.067
74	M. McLeod River	EXP	15-50-23-W5	11-Sep-01	MNWH	192	88	ns	ns	MNWH09	0200113		2.708
75	M. McLeod River	EXP	15-50-23-W5	11-Sep-01	MNWH	204	94	ns	ns	MNWH10A	0200114		2.754
76	M. McLeod River	EXP	15-50-23-W5	11-Sep-01	RNTR	192	87	ns	ns	RNTR01	0200115		2.968
77	M. McLeod River	EXP	15-50-23-W5	11-Sep-01	RNTR	164	58	ns	ns	RNTR02	0200116		2.669
78	M. McLeod River	EXP	15-50-23-W5	11-Sep-01	RNTR	181	63	ns	ns	RNTR03	0200117		6.869
79	M. McLeod River	EXP	15-50-23-W5	11-Sep-01	RNTR	177	53	ns	ns	RNTR04	0200118		3.071
80	M. McLeod River	EXP	15-50-23-W5	11-Sep-01	RNTR	181	76	ns	ns	RNTR05	0200119		3.274
81	M. McLeod River	EXP	15-50-23-W5	11-Sep-01	RNTR	142	28	ns	ns	RNTR06	0200120		1.391

Site Type: REF = reference; EXP = exposed
Spp: Species = RNTR (rainbow trout); BLTR (bull trout); BKTR (brook trout); MNWH (mountain whitefish);
Age (ann.): not sampled (ns)
Mat.: not sampled (ns)
* - one half (1/2) the value for those reported as "<" were used in the anlaysis.